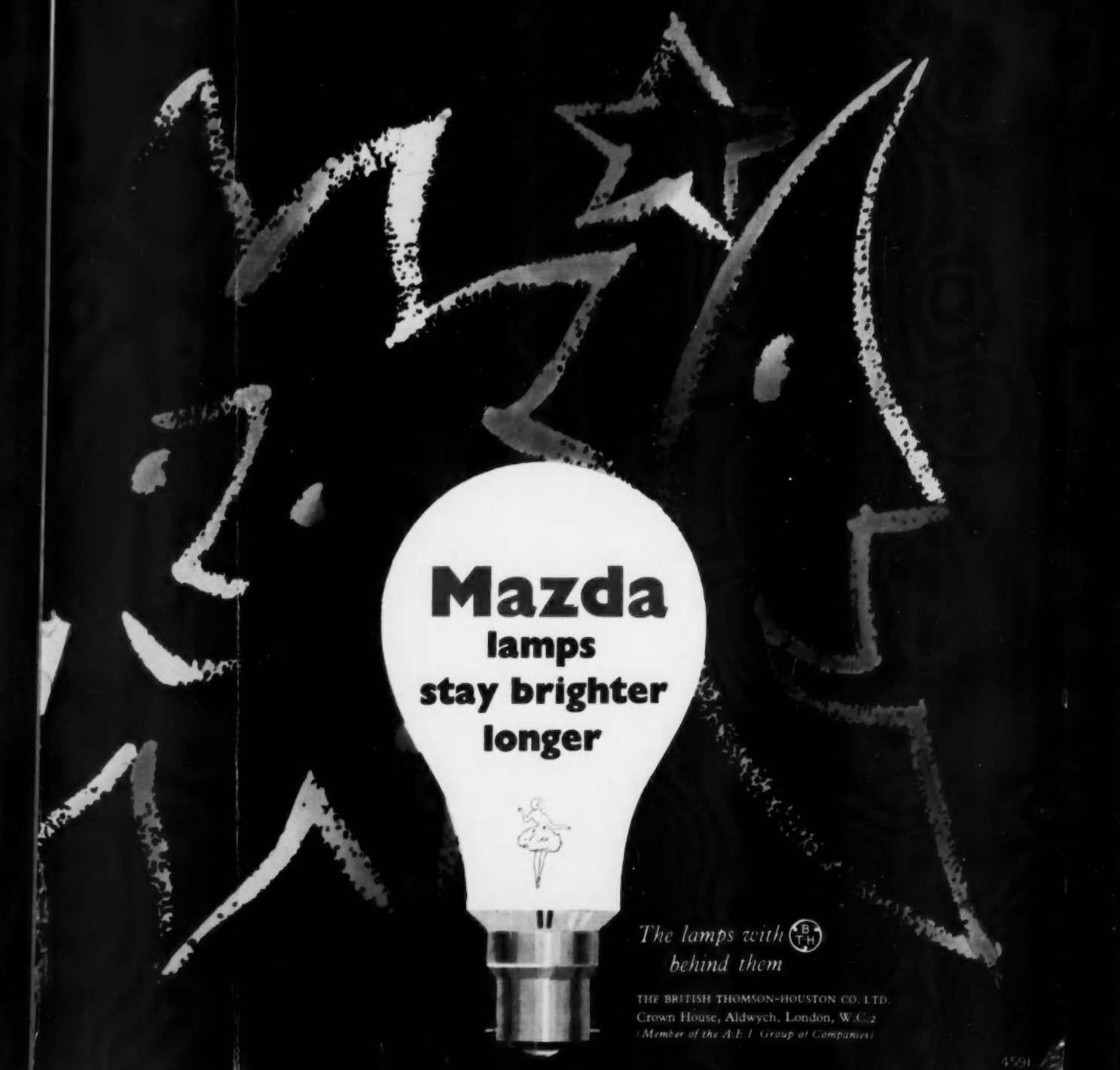
14 JULY 1955

ONE SHILLING

ELECTRICAL TIMES



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and Benjamin are in the lead when it comes to tungsten lighting. Our wide and varied range of tungsten fittings are already providing illumination that is stepping-up production in factories all over the world. *You'd* find it a profit-maker, too. Write for details or ask for our engineer to call.

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Smee's 18/54

Which battery is built like a Centurion Tank?

Answer—a Nife! It too is made of steel and like the Centurion Tank is built to stand up to the toughest use—to withstand shock and vibration and to operate efficiently under the severest mechanical conditions. In direct contrast to the Centurion Tank, however, a Nife Battery is small and compact, takes up very little space and requires virtually no maintenance. Also a Nife withstands the heaviest discharge, is free from self-discharge and is unaffected by idleness in any state of charge. *It repays its original cost many times over!*

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STANDBY POWER FOR AUXILIARIES AND CONTROL CIRCUITS
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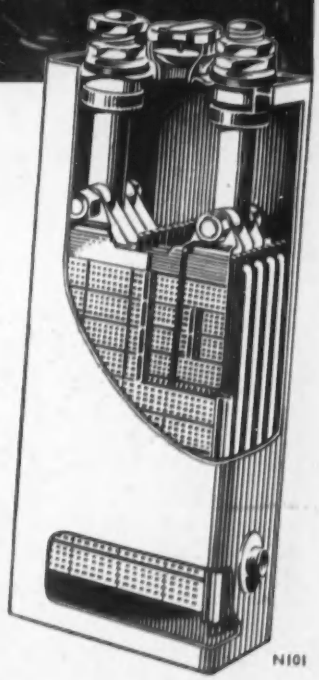


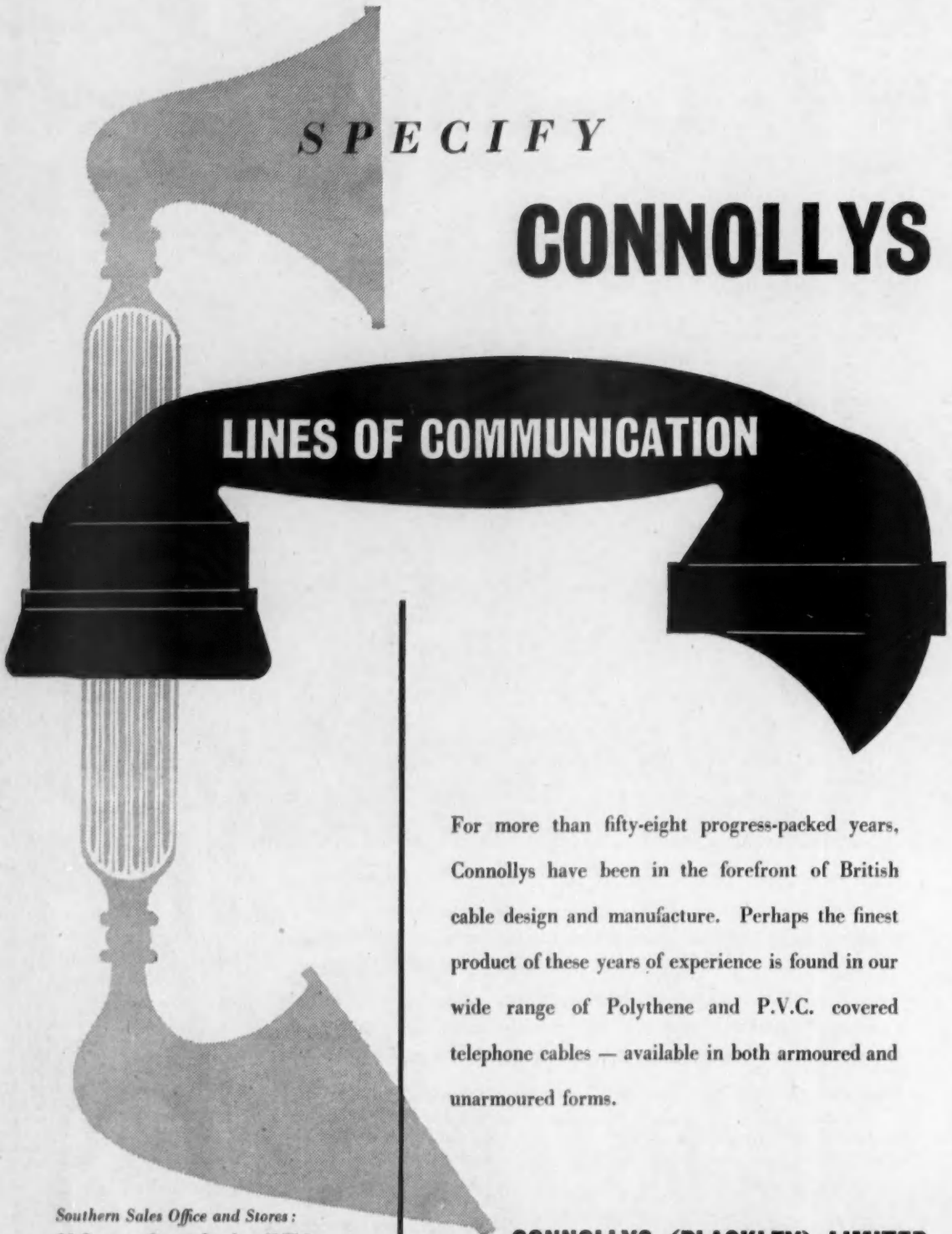
N101

Its name is NIFE

—THE **STEEL** ALKALINE BATTERY

A

Nife Batteries · Redditch · Worcestershire



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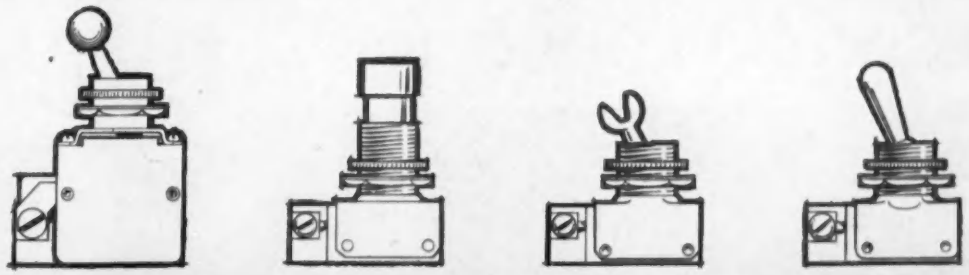
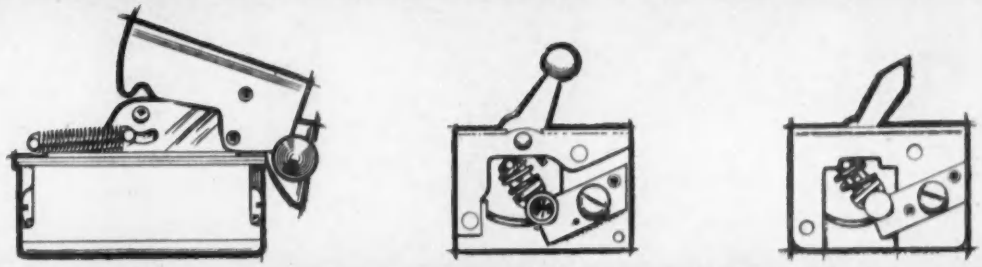
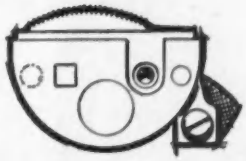
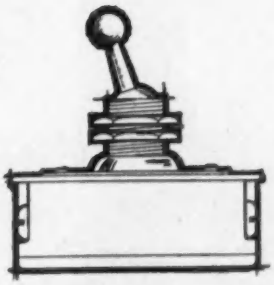


APPLIANCE



SWITCHES by





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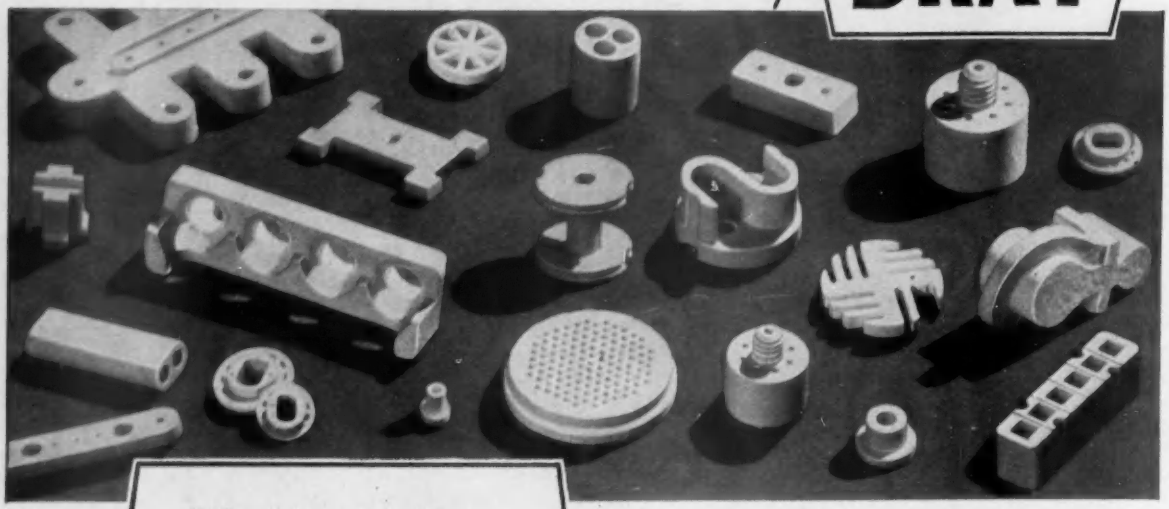

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Oven: 13″ wide x 11½″ high x 13″ deep. 1.2 kW.
Grill-Boiler: 10½″ x 8″, 2 kW.
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It roasts, bakes, boils, fries, grills and toasts.

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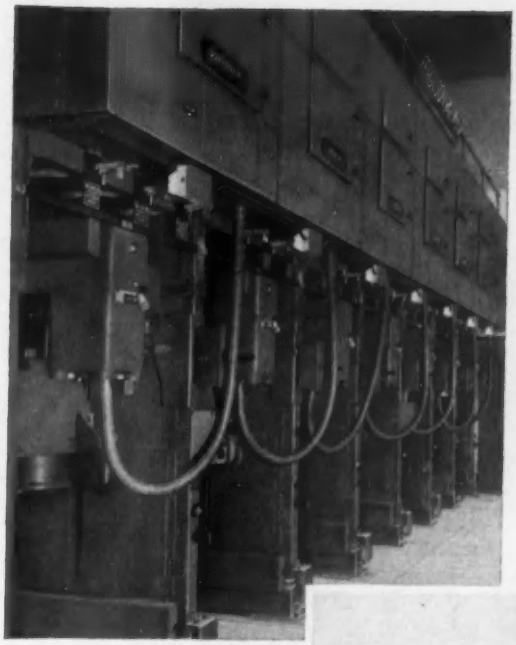
CHADDERTON POWER STATION

was supplied by 'FERGUSON PAILIN'



VSLP10 Switchgear

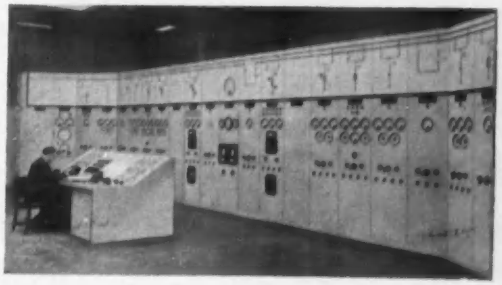
VTP13/3 Switchgear

Switchgear and Administrative block

The Chadderton H.P. Station is a major addition to the Power Station building programme of the Central Electricity Authority, connected into the National Grid through an existing 132 kV outdoor substation.

'Ferguson Pailin' have been privileged to supply the main 33kV switchgear. The power source switchgear is of type VTP13/3, for 1500 MVA service, whilst type VSLP10 switchgear, of 500 MVA breaking capacity, is installed to provide local distribution through substations of the Area Board at Middleton, Greenhill, Royton and Failsworth.

In addition, 'Ferguson Pailin' supplied the main control room equipment.



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The associated companies were *independent* companies. The new group is an *independent* group, with all the advantages this spells for its customers in prompt service and flexible price arrangements. Prove these advantages in any cable problems now confronting you.

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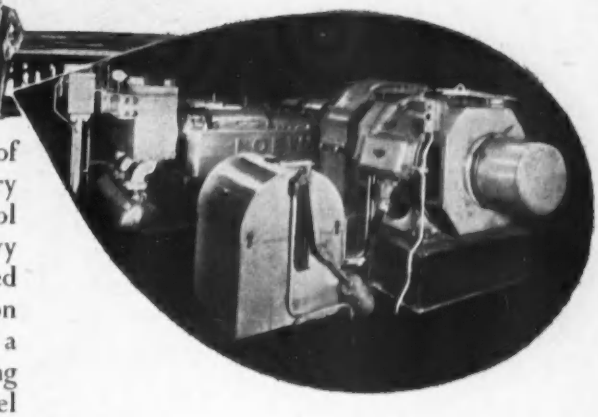
MOTORS and CONTROL GEAR by METROVICK



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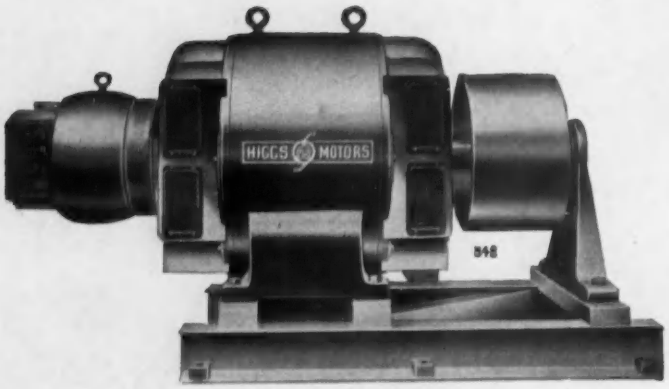

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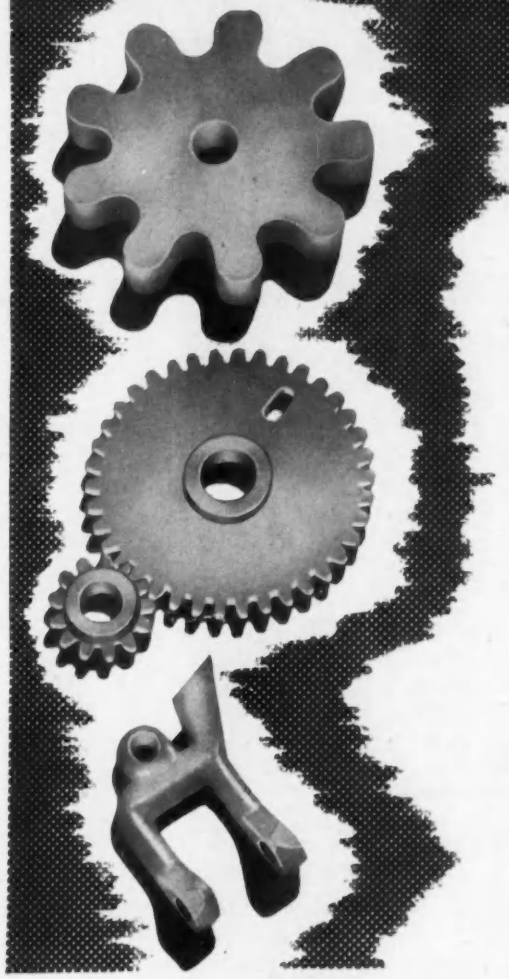

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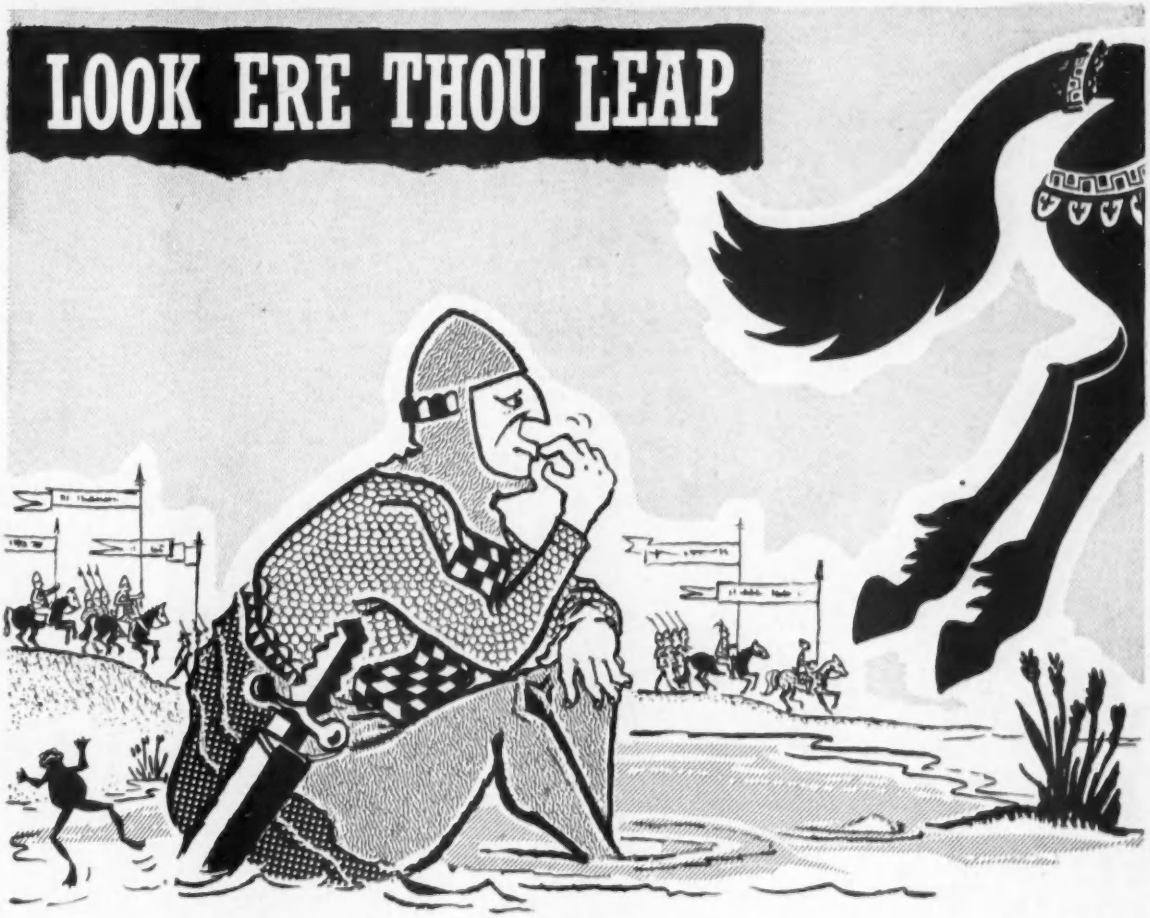

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***Then* you'll be leaping onto safe ground.**

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In Mecca as in Great Britain

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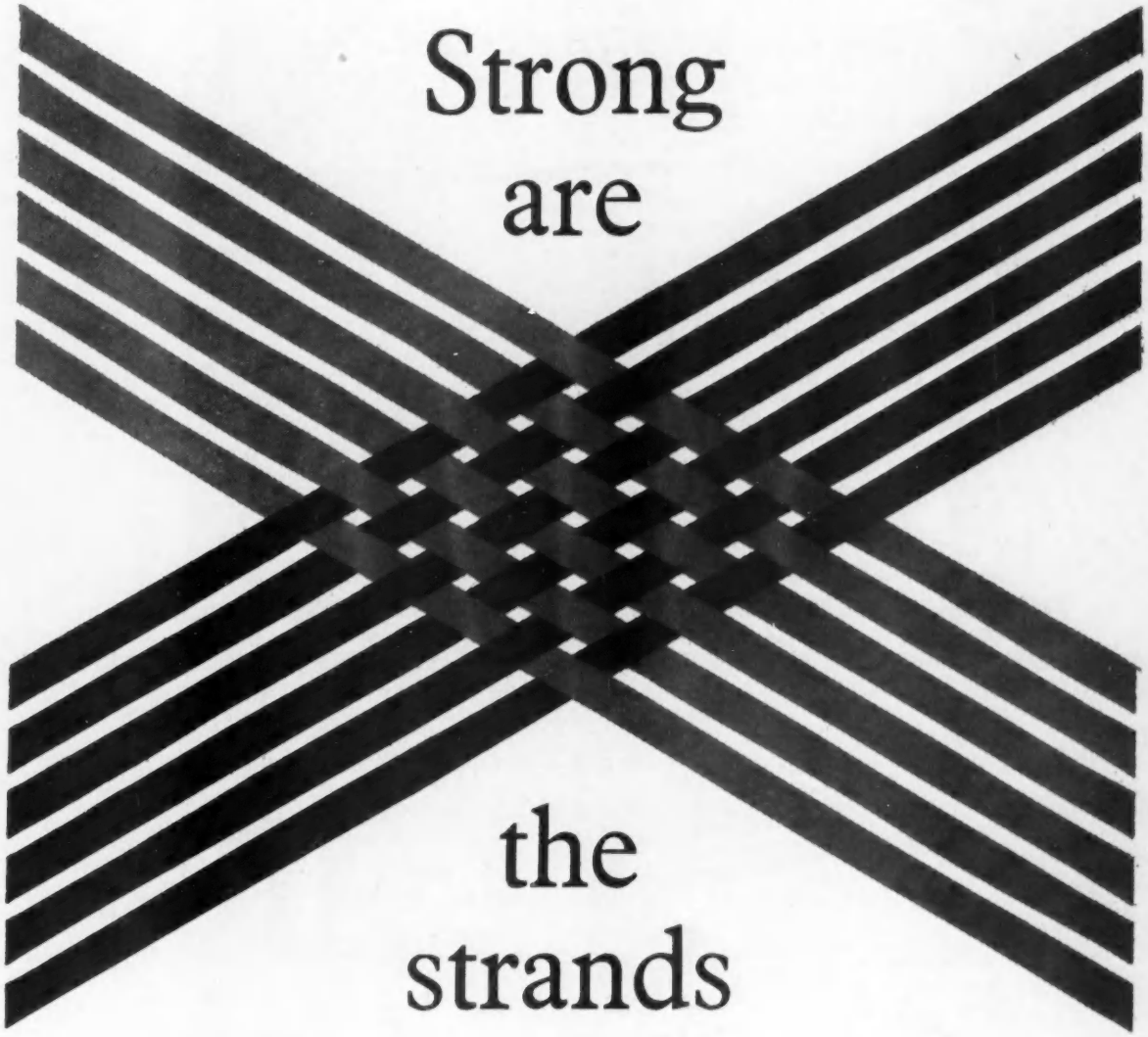

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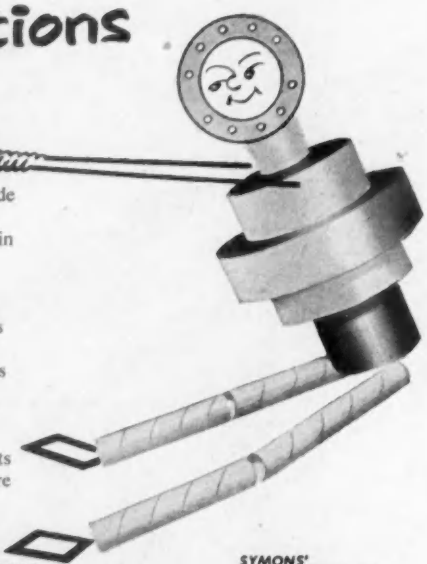

"DUPLY" is varnished cotton cloth bonded firmly to elephantide or leatheroid. Other varnished fabrics are also used, straight or bias cut, and the material is supplied in rolls 35/36" wide or in tapes of any width.

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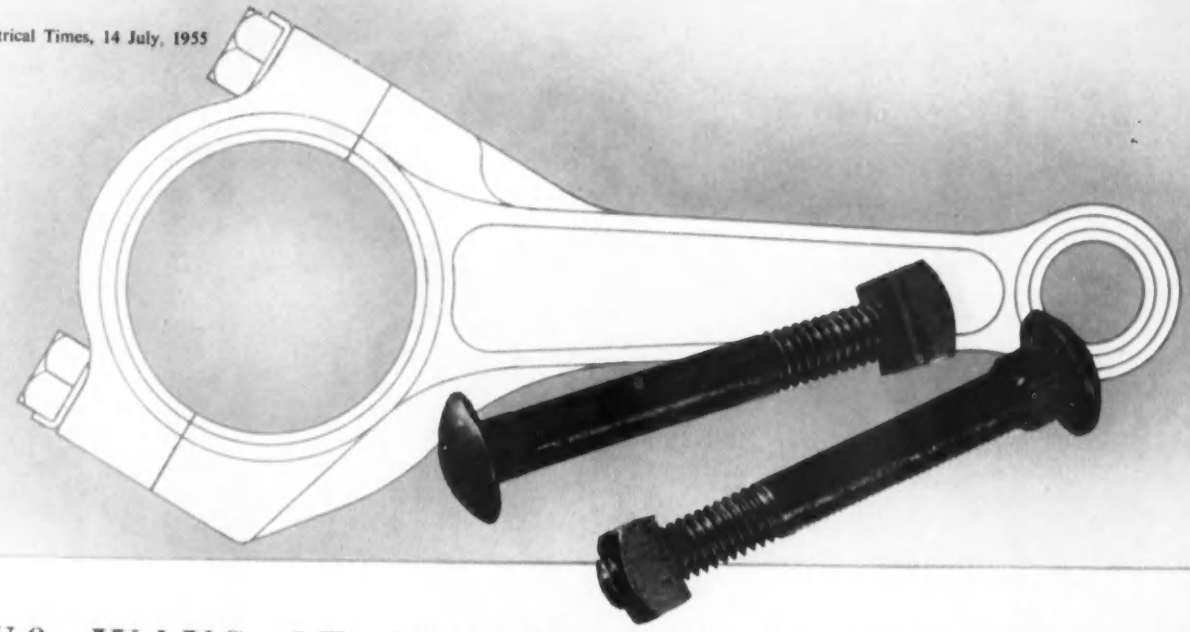

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OR

"You wouldn't put coach bolts in your big ends!"

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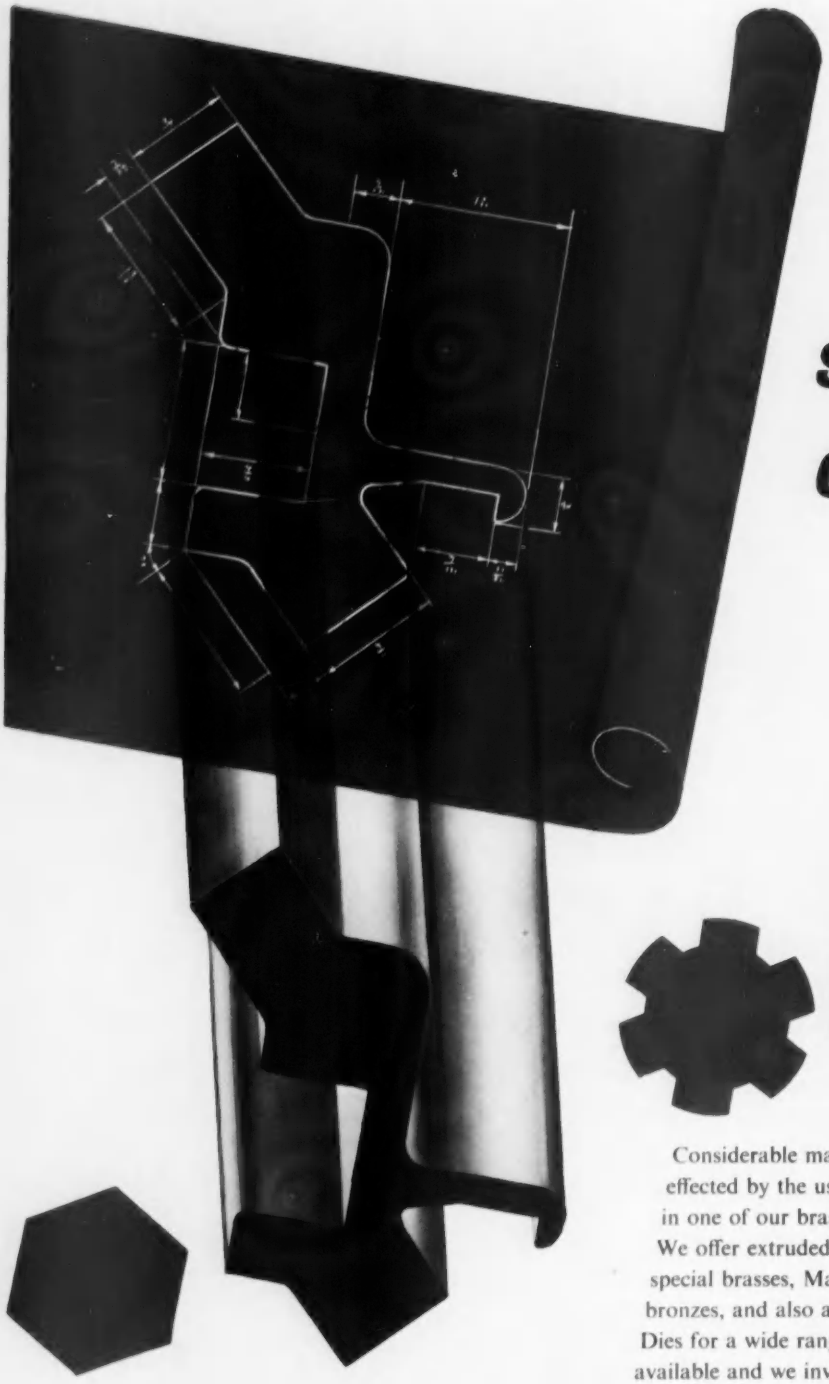

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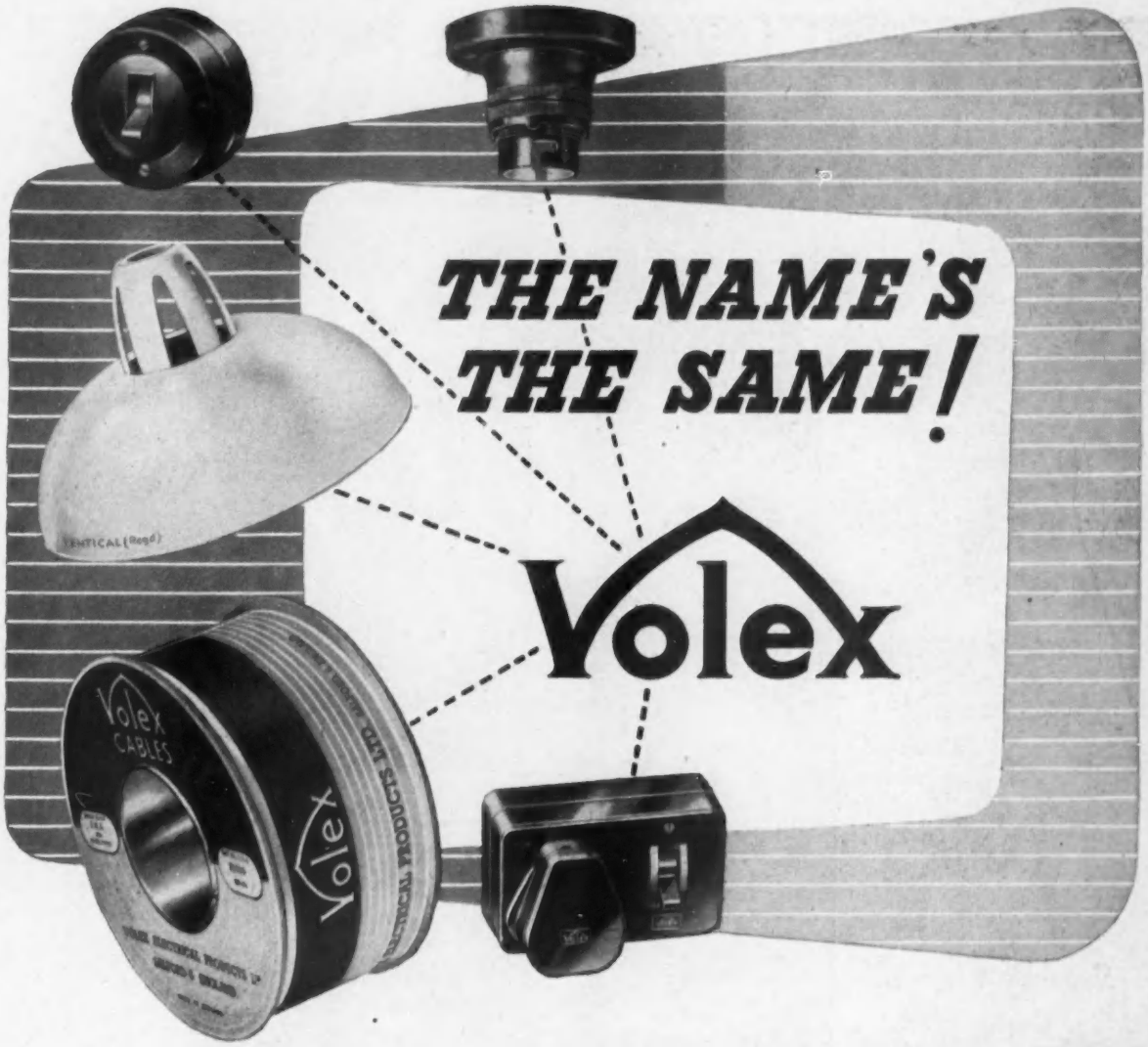

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★ FITTINGS
★ ACCESSORIES
★ CABLES

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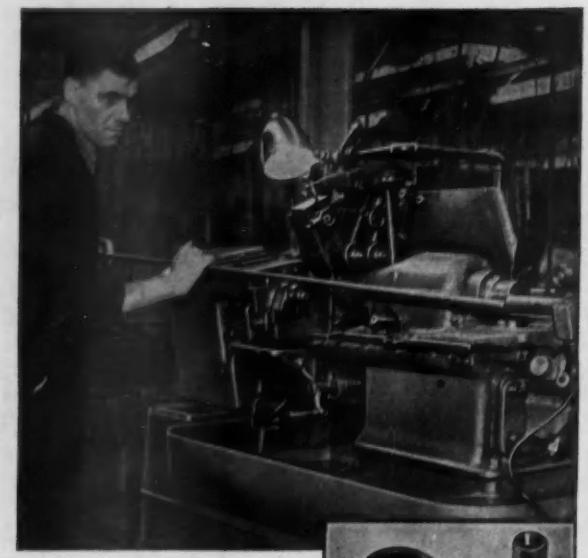

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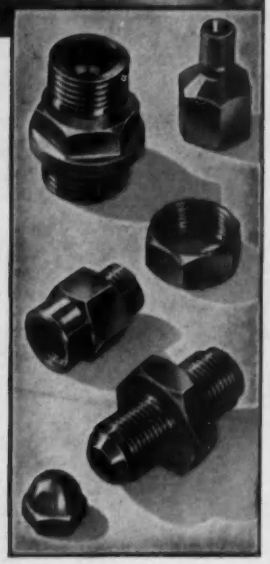

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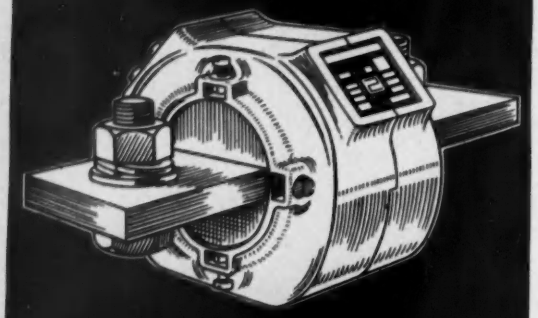

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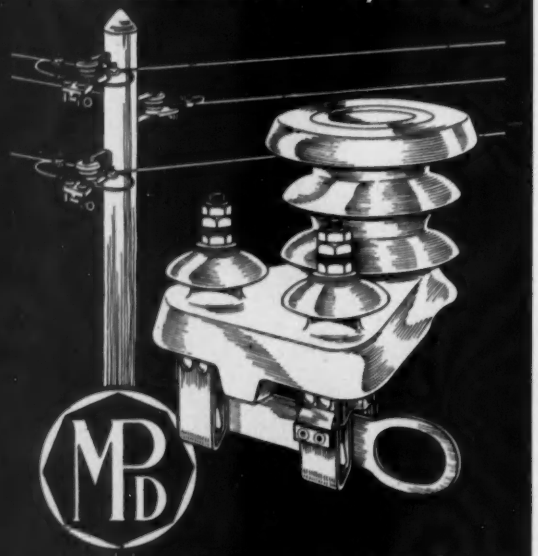

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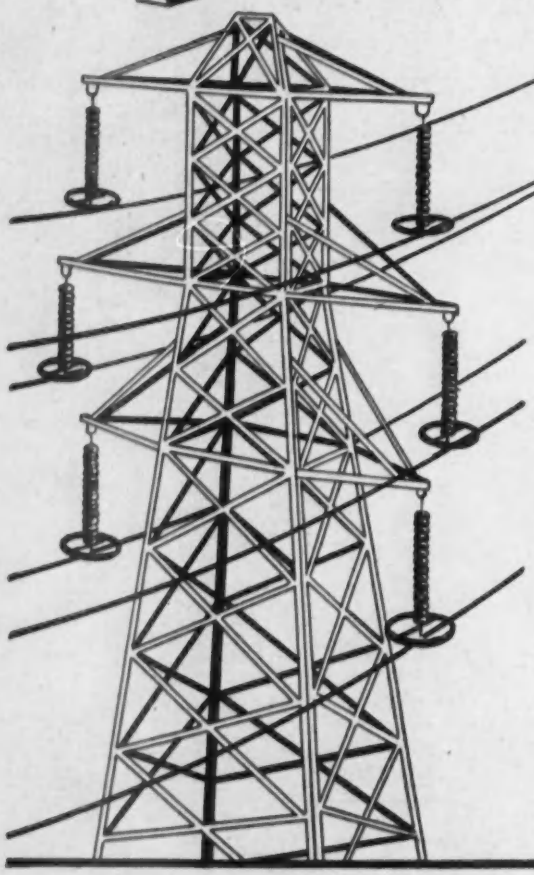

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		B.S.88: 1939	B.S.88: 1947		B.S.88: 1952	
		440 AC 4	440 AC 4	440 AC 5	440 AC 4	440 AC 5
30	TIA30	617	1016	2074	3334	3246
60	TIS60	616	903	2022	3338	3254
100	TC100	615	932	2021	3335	3263
200	TF200	251	933	2033	3278	3237
300	TKF300	252	934	2032	3255	3238
400	TM400	629	935	2031	3249	3240
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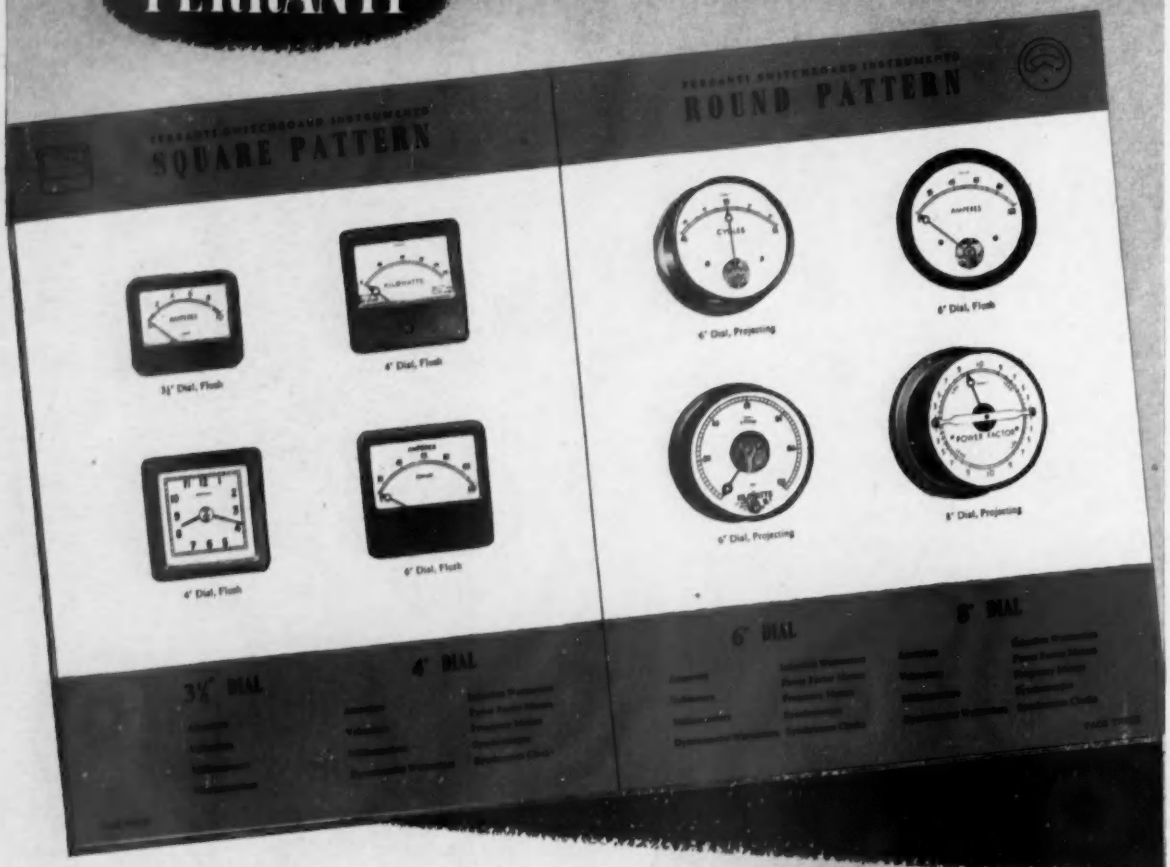
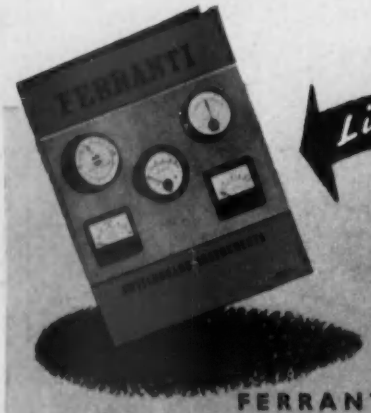
FERRANTI *Switchboard Instruments*



Illustrated above are several Ferranti Switchboard Instruments from a wide range. Shallow pressed steel cases 3¼", 3½", 4", 6" and 8" round or square dial. Projecting or flush mounting. All types of Ferranti switchboard instruments are also available in hermetically sealed cases.



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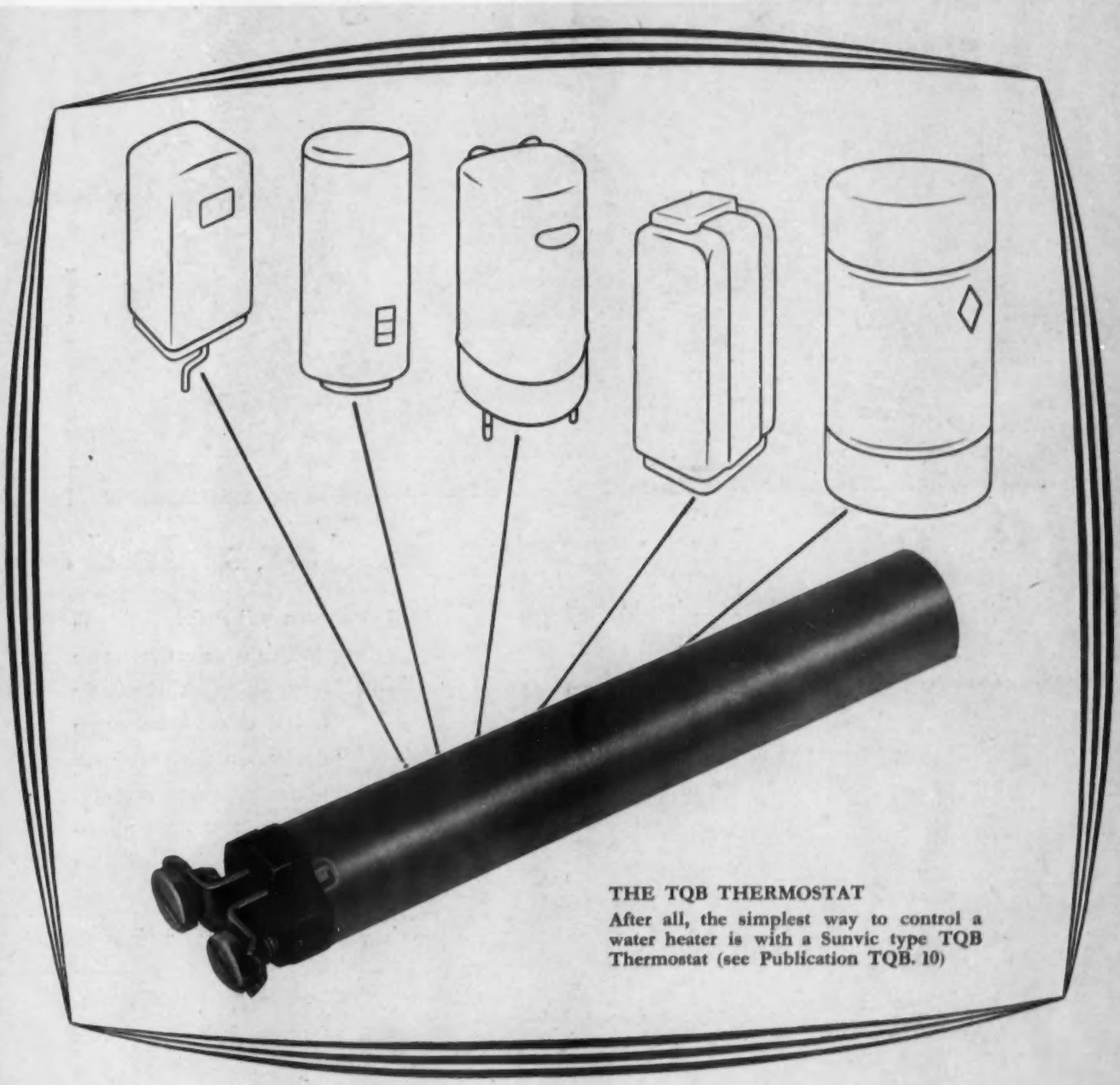

THE TQB THERMOSTAT

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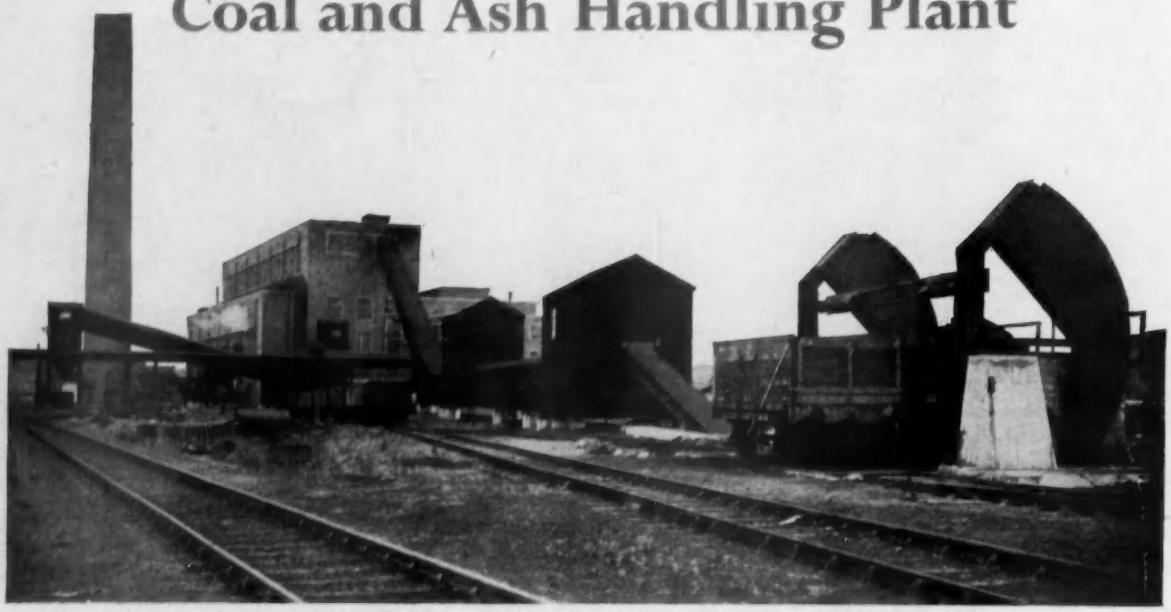
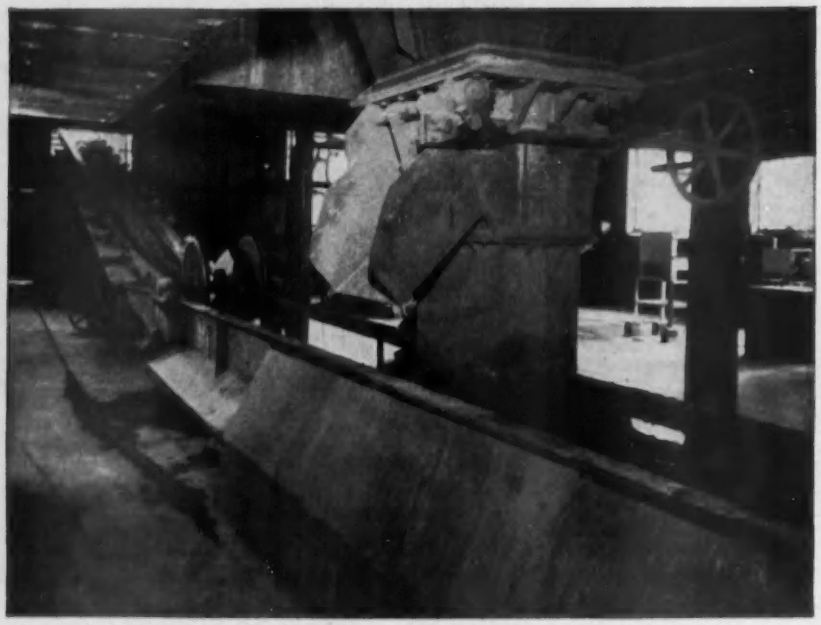
Coal and Ash Handling Plant



Showing the Wagon Tippler, Weighbridge and Main Conveyor rising to power station.

at John Summers & Sons Ltd.

The conveyor system handling coal and coke for the boiler plant at Shotton will at first deal with approximately 650 tons per month, but has been designed to carry greater quantities when extensions are fully developed. Incoming fuel is unloaded by wagon tippler and transferred to the main belt conveyor which incorporates a recording weighbridge, and then rises 80 ft. to the distributing conveyor where a travelling tripper discharges the fuel into the appropriate bunkers. Spent ash is discharged from the boilers to the John Thompson Patent Submerged Ash Conveyor, and raised by a further conveyor to the ash bunker.



Submerged Ash Conveyor — the belt runs in water, minimising power consumption and maintenance costs.

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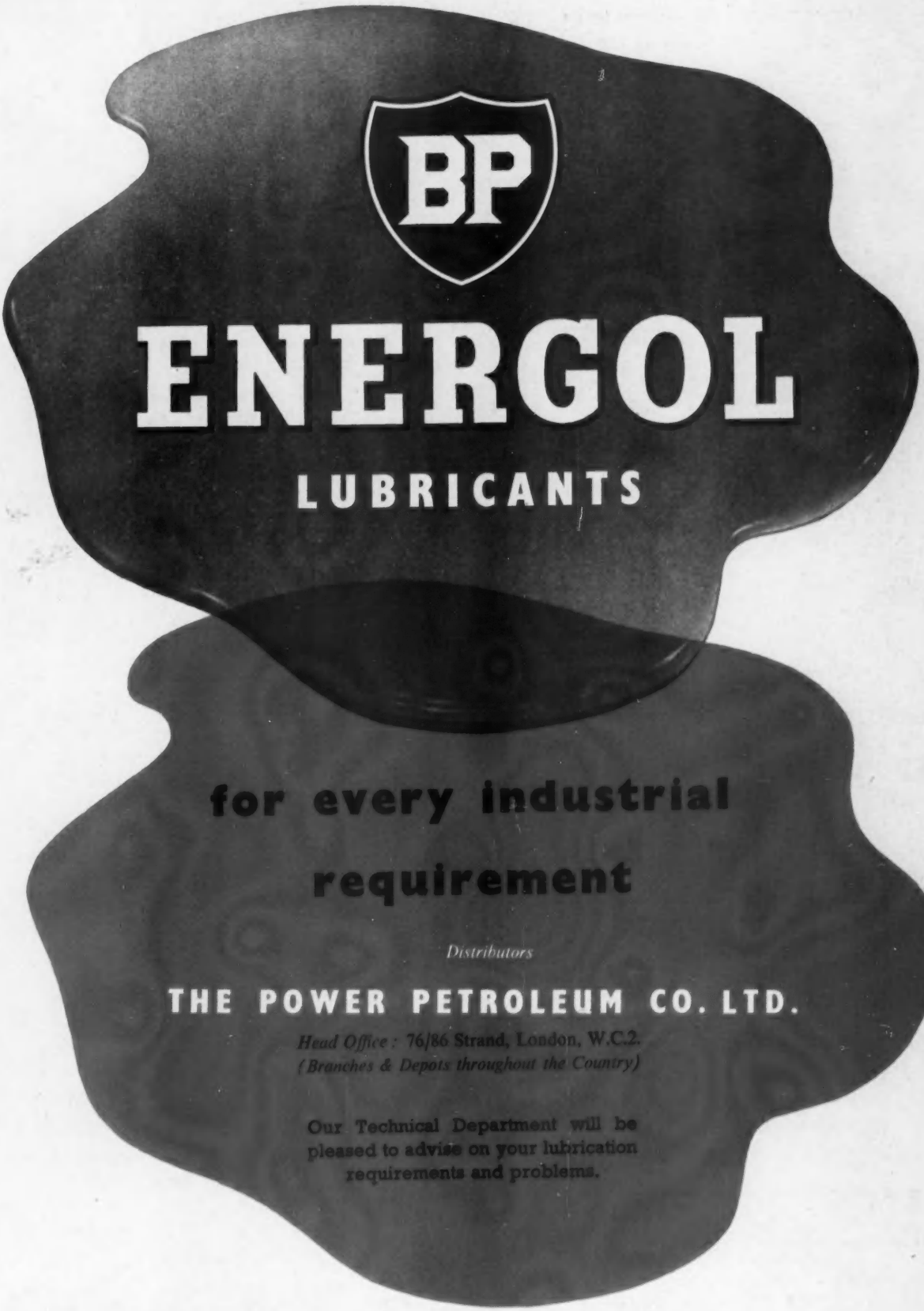
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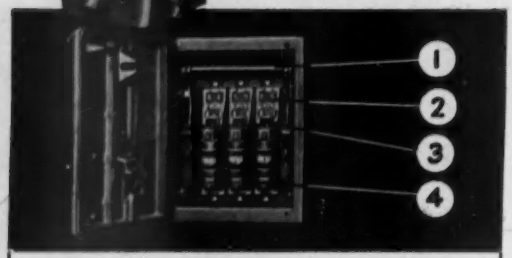

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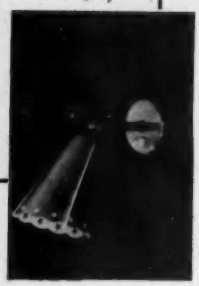

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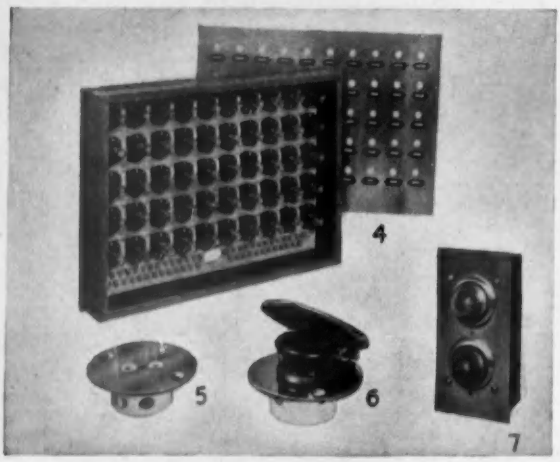

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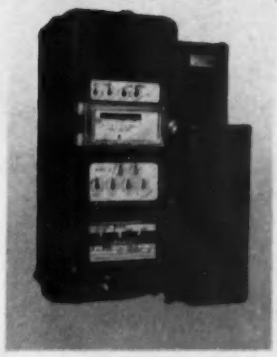

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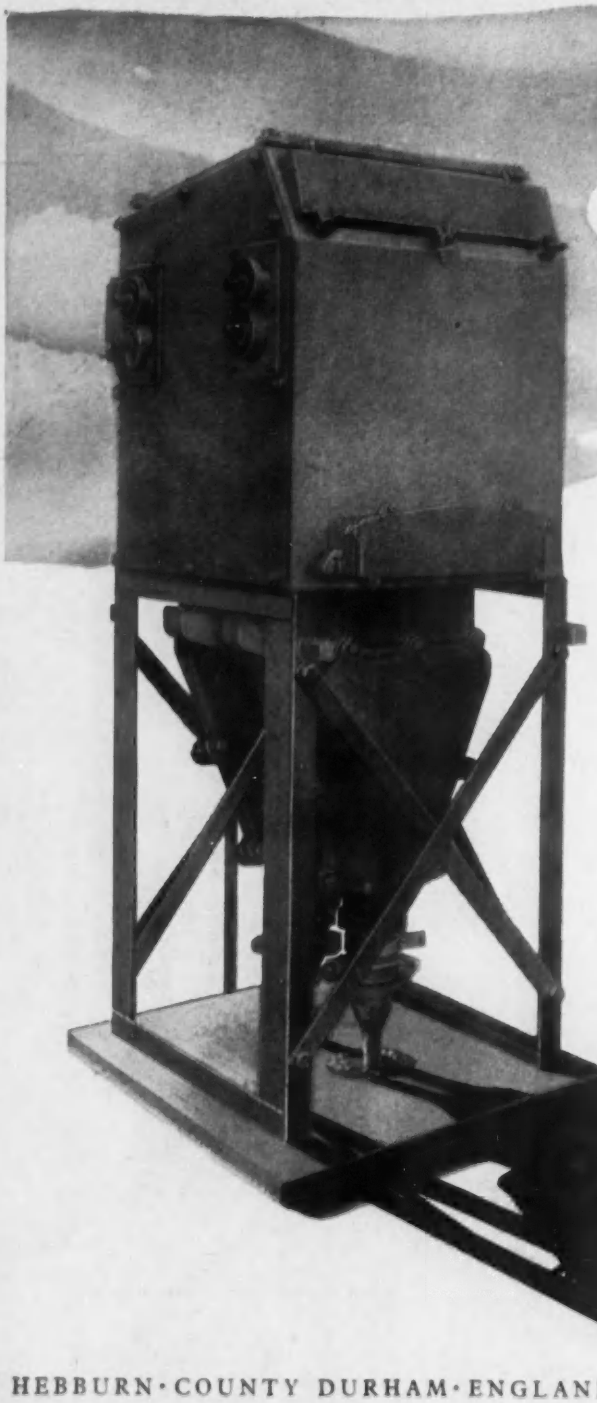

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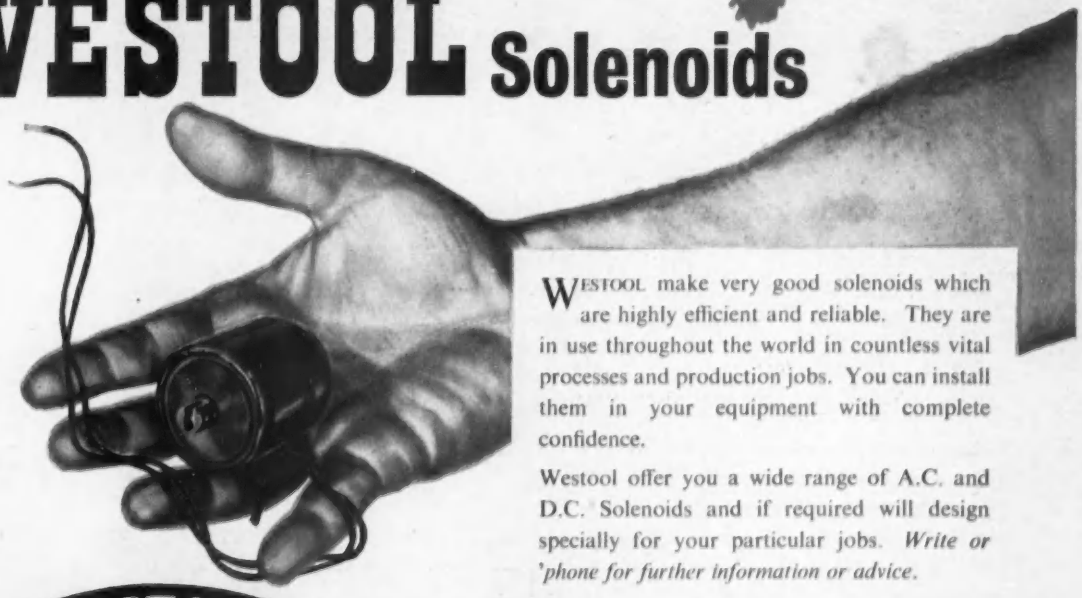

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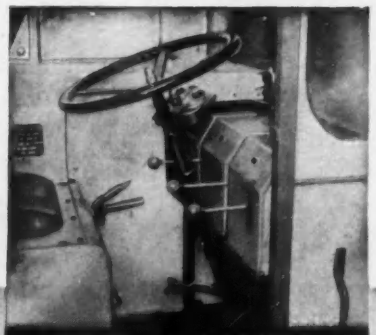

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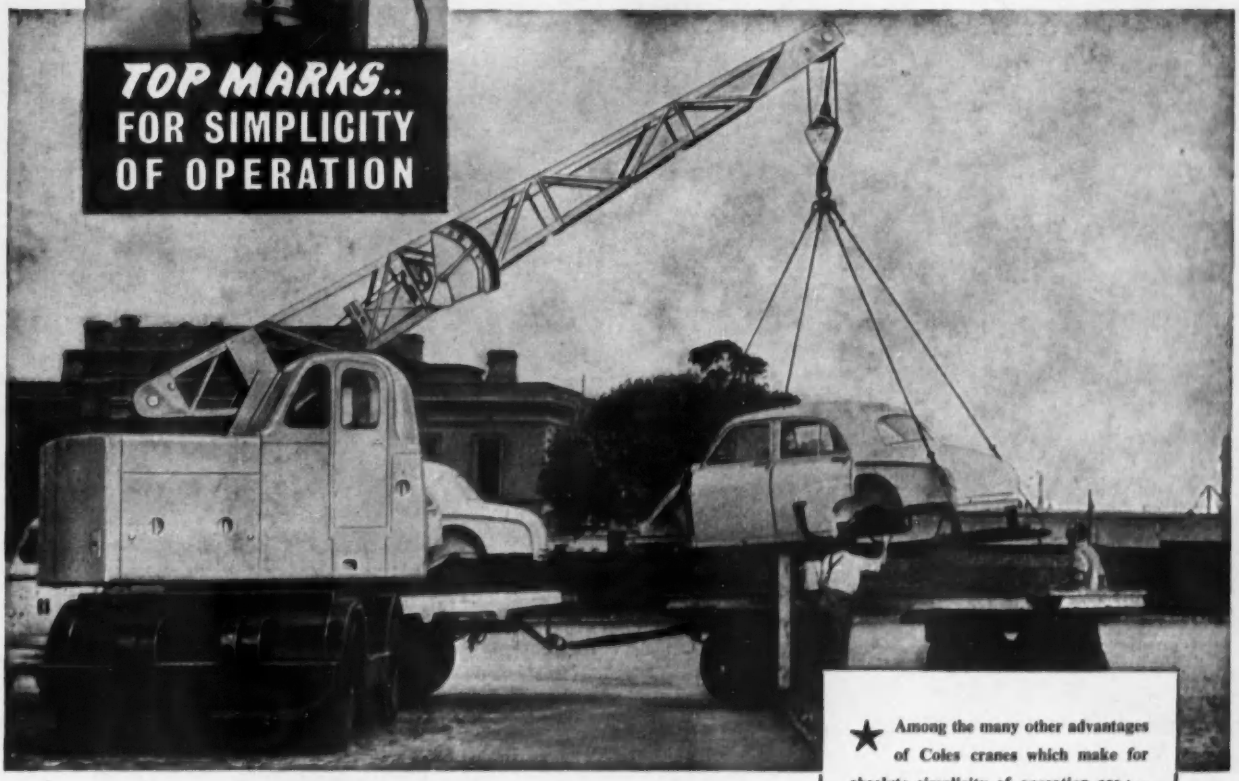

YOU, SIR! Yes, *you* . . . could lay aside this magazine and after just 30 minutes instruction could operate a Coles Crane. Not like an expert, perhaps, but control it none the less, and if that isn't saying how easy it is . . . well!

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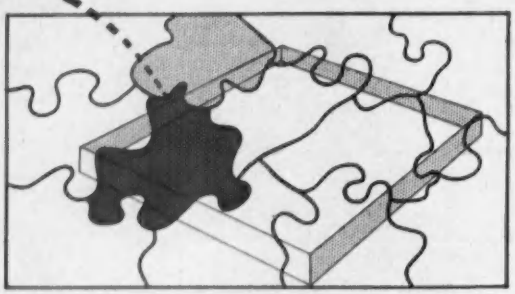

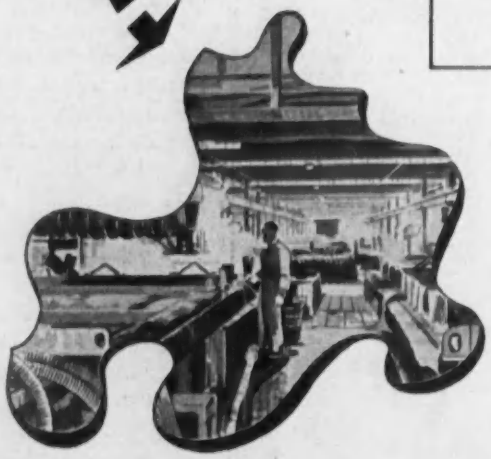

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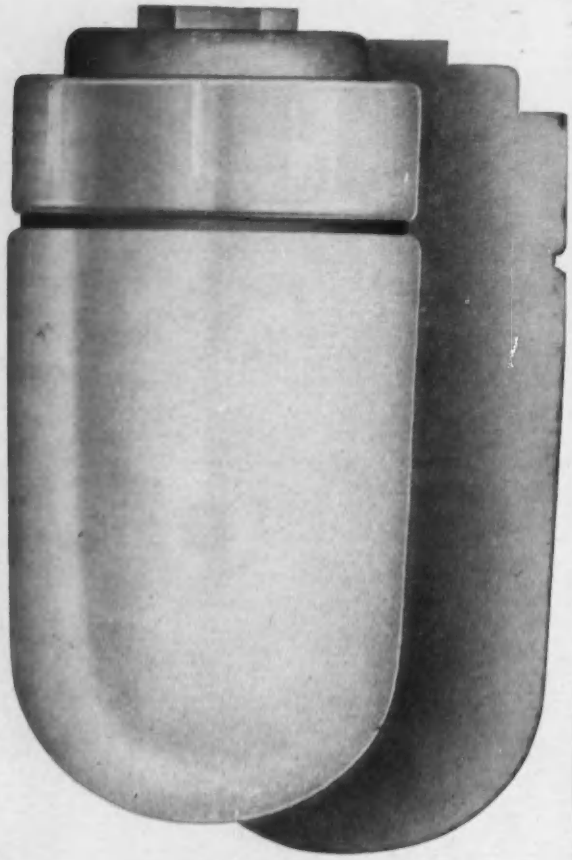

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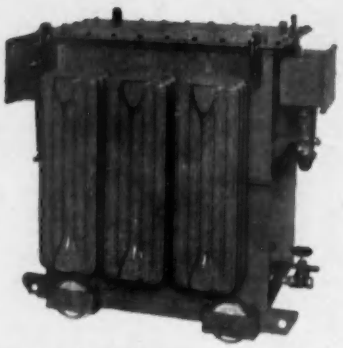

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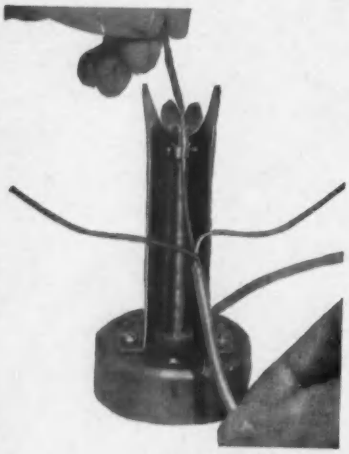

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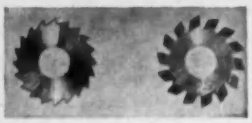

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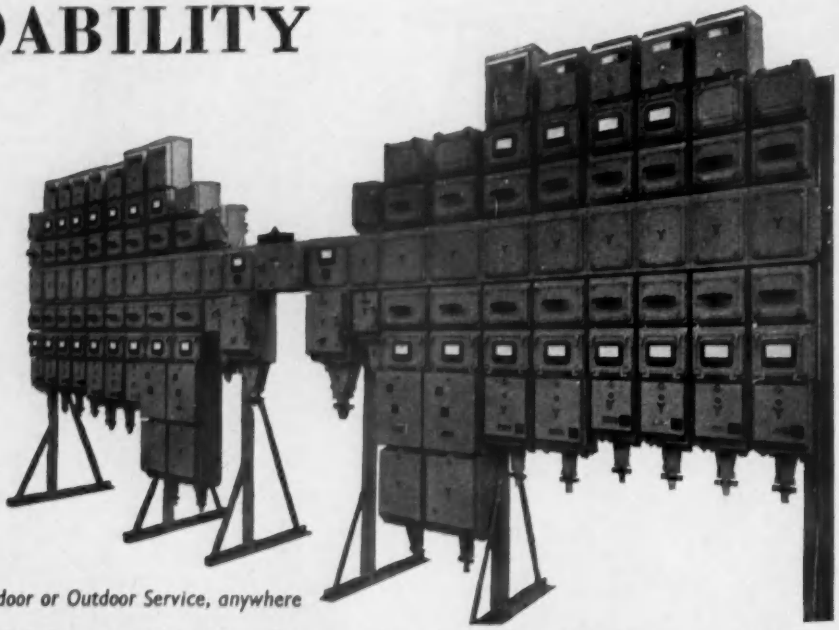

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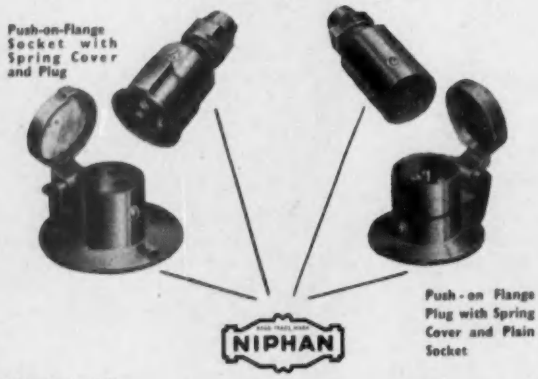

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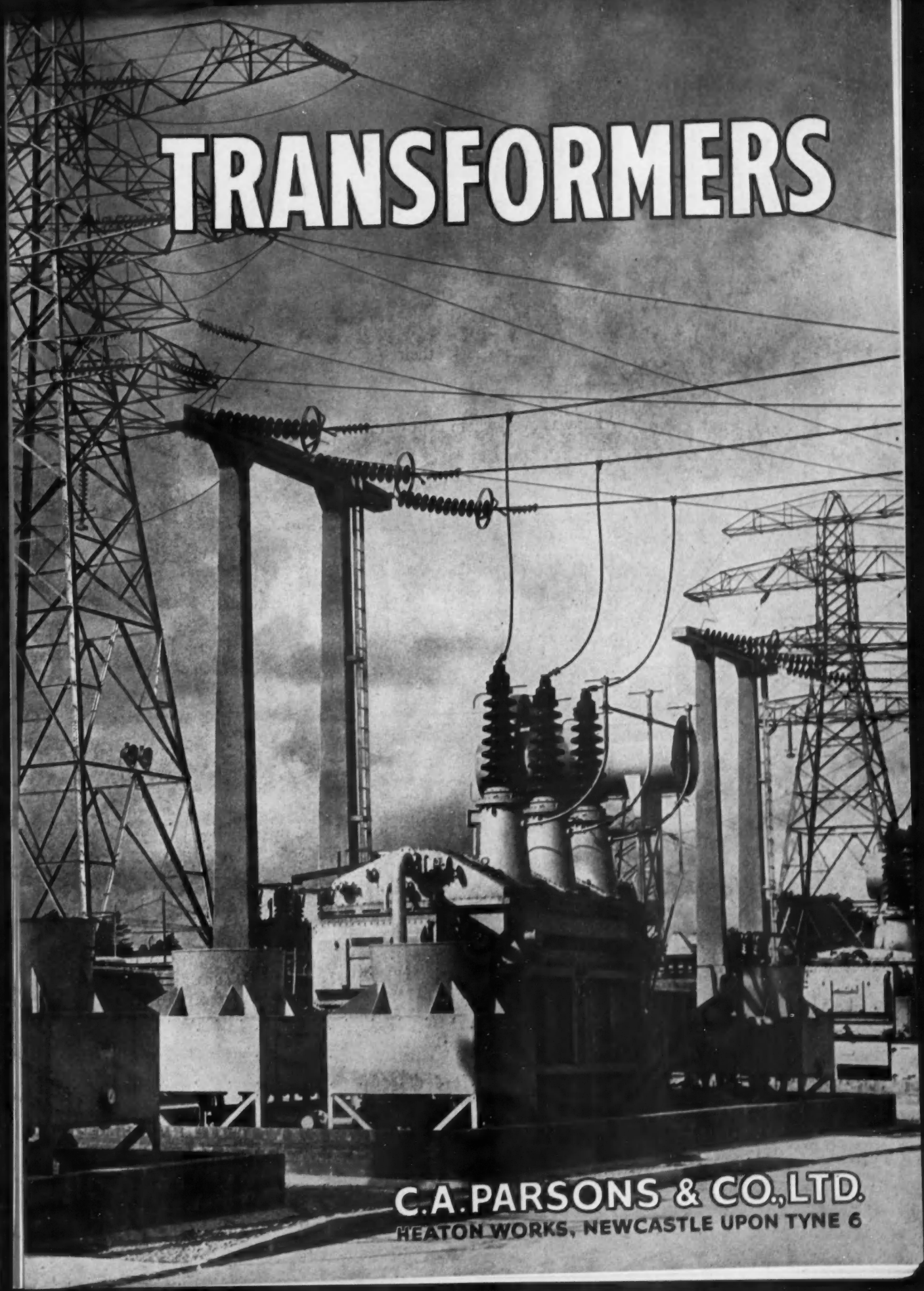
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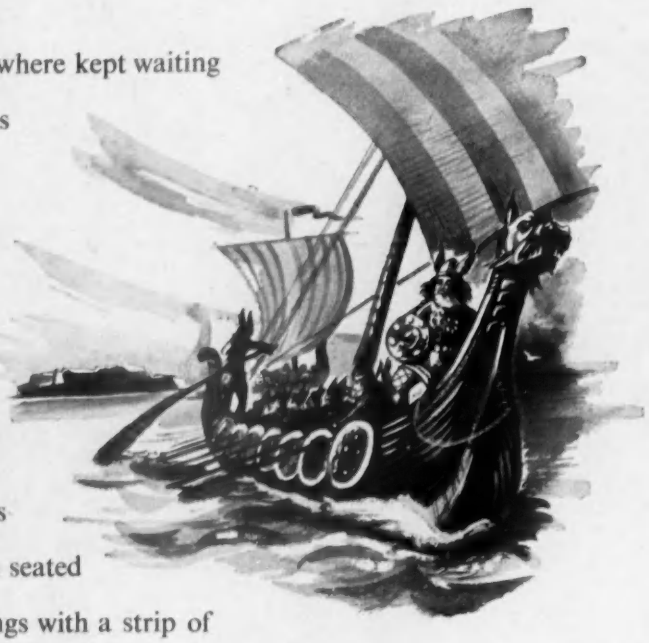

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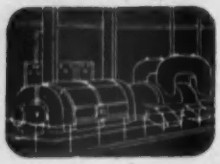

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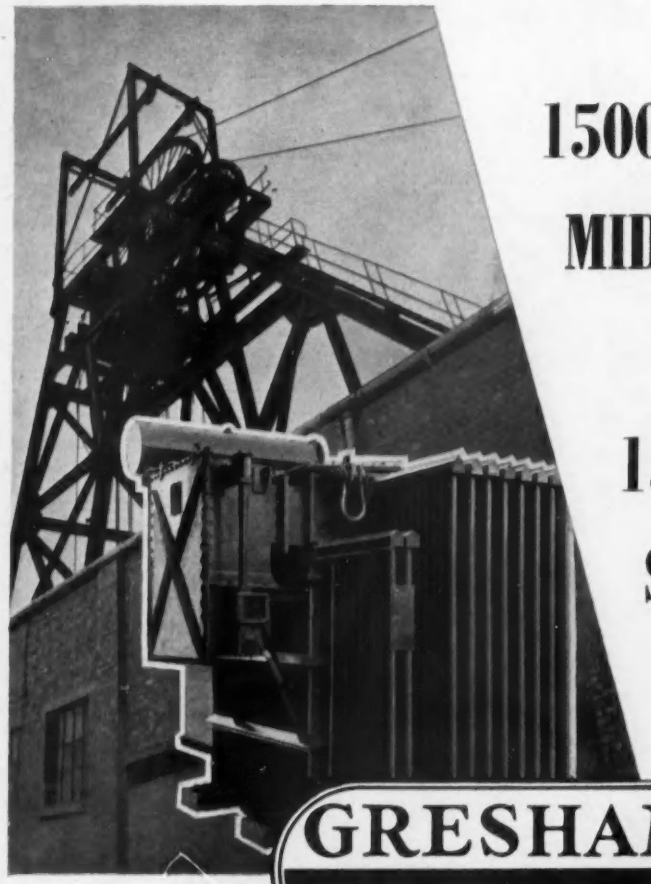

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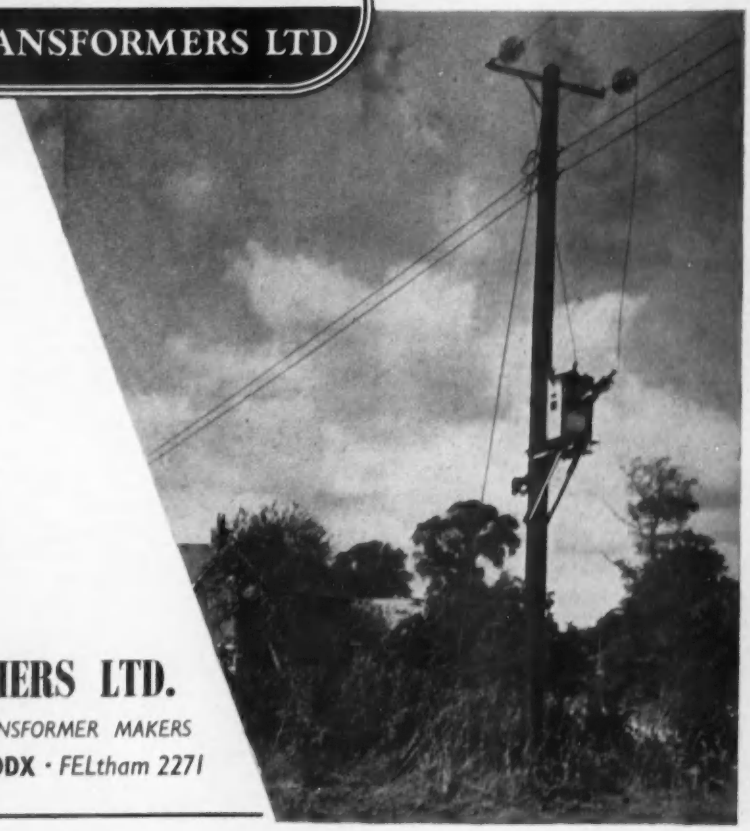

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 14 JULY, 1955
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THE PENNY-LINE

The expected increase in the price of coal has turned out to be at least as high as the most pessimistic of forecasts, so high as to make its impact felt throughout the economy of the country. As the largest user of coal, the electrical industry will be called upon to meet an additional bill of £18m. In the light of this new premium on thermal efficiency, the first step should be to overhaul the plant programme. Although encouragement can be taken from the rise in operating efficiency, the short fall in new generating plant last year was disappointing. Prospects this year are better, but with every advance in coal price it is necessary to view new plant as much from its ability to save fuel as to meet the ever increasing maximum demand. It is, however, the area boards who will have to foot the bill, by operation of the price of coal adjustment clause. They, in turn, will automatically recharge the increase to large industry, leaving a residuum of domestic, commercial and small industrial consumers on fixed tariffs. The cost of the increase, to the boards, which amounts to 0·066d. a unit, is a serious one and it is unlikely that a rise in tariffs can be avoided. With many boards already charging a penny a unit for the final block tariff, the question arises will the penny-line be broken? One board has already met this problem by preferring an increase in the fixed charge to raising the price per unit and it is doubtful whether any board at the present time dare face the moral opprobrium and commercial risk of raising the final unit charge higher. With the general satisfactory results of the industry's past year, there is reasonable time for manœuvre on the tariff front and the present round of increases on all fuel industries should swing the balance of sales argument further towards electricity, so the rising consumption of electricity should not be threatened if the penny-line be held.

C.E.A. RESEARCH

With the opening of the extensions to the Leatherhead Laboratories, the C.E.A. has now a research organisation specifically designed to tackle those problems of generation, transmission and distribution inseparable from the operation of a large complex integrated system. As Dr J. S. Forrest emphasised recently, the investigations undertaken are of an essentially practical nature arising immediately from those difficulties experienced in the field which demand immediate attention. They therefore differ in form from the work of co-operative research organisations which are engaged in long-term studies which may require considerable time to initiate. Nor do the laboratories duplicate research at manufacturers'

establishments where the primary object is improvement in design. Because of this accent on field research the laboratories have been planned to provide the utmost flexibility to enable all types of problem to be undertaken. There has nevertheless been no question of building and equipping a large research establishment and then looking round for work to employ the staff and apparatus. At the moment, the laboratories are fully employed, and, indeed, have more work than they can readily undertake. Future development in the electrical industry implies equipment of increasing complexity and it may well be probable that further extension of facilities at Leatherhead will be needed in the near future.

MACHINE RATING CLARIFIED

Four British Standards with slightly varying conditions have for many years covered the range of large motors and generators. With the publication last week of B.S. 2613 "The Electrical Performance of Rotating Electrical Machinery," these are at last combined in one document, which should prove a welcome convenience. Since three of the standards replaced have stood without major revision for thirty years or so, it is not surprising that some large changes are apparent in the new Standard. These are summarised at length elsewhere in this issue, but a few stand out. In particular, the new requirements extend to the full range of larger motors, the modern practice of applying continuous maximum rating without allowance for overload, though there is a temporary exception for certain types of machine rated, in the prevailing parlance, at below 50 h.p. per 1,000 r.p.m. But when the reclassification of insulation at present being carried out at international level is completed, it is stated that this exception will disappear, and c.m.r. will apply to the electrical performance of all B.S. motors and generators except those for specialised application. The result should be a better understanding by application engineers generally of the significance of rating. Although this is the major alteration evident in the new standard, there are several other changes which deserve close study by purchasers of rotating electrical machinery. One comparatively minor addition catches the eye as particularly valuable. This is a table of recommended tolerances applicable where certain characteristics are guaranteed: and the magnitudes it recommends may cause surprise to those who only occasionally have to specify motors and generators. The number of cases of 10% tolerance and above for important characteristics such as starting current, ranging up to 30% to 40% for transient reactances and guaranteed slip of induction motors, gives an air of approximation more usual to the electronics field than to the comparative close-limits of rotating machinery.

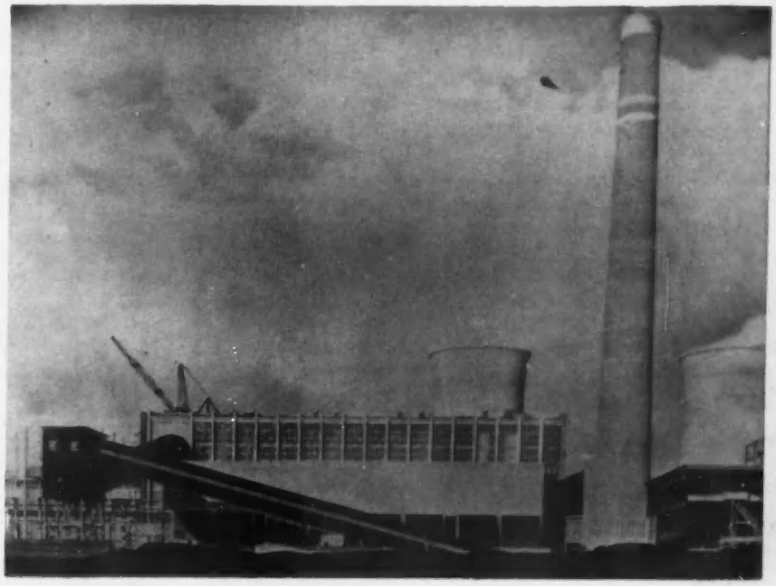
FIGURING ON THE FARM

This year's Royal Show, spreading over broad acres near Nottingham, emphasised again the multifarious parts that electricity can play in the increasingly mechanised industry that agriculture is becoming. It provided an appropriate background to the review of Productivity in Farming which the British Productivity Council issued last week. This review recognised explicitly that "one of the most important factors in increasing productivity (and also comfort) on the farm has been the extension of the electricity service." In many ways the review is disappointing from the electrical viewpoint, for it goes into few details of electrical applications in field or farmyard, giving more attention to the farmhouse amenities. However, its main recommendation is for more detailed costing of farm operations, and if this is adopted by farmers it is likely to lead to a more promising climate of opinion towards the installing of electrically powered plant. The cost of obtaining a supply and the first cost of associated wiring and motors, may seem heavy when compared with competing oil equipment, but if proper accounting analysis is applied to total costs, then the lower maintenance requirements of electric drives, and the lower cost of useful energy show up clearly, as previous articles in our pages have demonstrated. Even the first cost problem can be made more manageable by taking full advantage of the various grants and allowances obtainable under various farming acts and under income tax regulations. In this last connection E.D.A. have done a good job recently in issuing a booklet summarising these capital-saving possibilities for the farmer. Electrification is less expensive than it seems, and farmers need to be told so convincingly, or they may miss an opportunity of improvement for fear of costs that they will not in fact have to meet.

NEW LOOK AT SOLAR kWh

Estimates of the probability of finding a way to apply to practical purposes the radiant energy from the sun which daily reaches the world's surface have varied widely, with pessimism as the prevailing thought. On present standards, the chances of economic utilisation seem slight, but the pressing needs of growing world population, even in a nuclear age, are a constant spur towards new discoveries in this field. In his presidential address at the B.E.P.C. recently, Sir Harry Railing judged direct conversion of solar energy into electrical energy as one of the two major problems challenging the electrical engineer, for which a solution must eventually be found (the other was a means of storing electricity). Recent advances, notably silicon and germanium photo-cells, offer possibilities denied with most other techniques, notably that of continued operation at reasonable efficiency even in the absence of bright sunlight; while the prospect of exploiting photo-chemical reactions through simple organisms is always tempting. Now comes news that the Association for Applied Solar Energy, a United States organisation, is arranging an international meeting in Arizona this autumn which has as one of its principal objects the determination of promising lines of research towards effective utilisation of solar energy. Whatever results are reached, it is to be hoped that they will show appreciation of the fact that large-scale use of solar energy would render great tracts of land useless for food production, and that rising standards of living will demand more food as well as more energy.

Meteor



OLDHAM STATION SUPPLIES BOTH LOCAL DISTRIBUTION AND THE NATIONAL GRID

Chadderton "B"

CHADDERTON B power station, of the North West, Merseyside and North Wales division of the C.E.A., commenced its history in 1943. Last week, the completion to the first stage of operational working was marked by an opening ceremony performed by Councillor F. Kenyon, Chairman of the North West Electricity Consultative Council. It was in 1943 that the Oldham Corporation investigated a replacement generating plant for their existing power station (now Chadderton A). From several possible sites, one adjoining the existing station was selected, and Messrs Kennedy and Donkin were appointed consulting engineers for the project. Three changes in planning, to keep in line with technical developments saw consent for the first section of a 4 x 60 MW station finally granted to the B.E.A. in January 1950. At present two of these sets are installed. At the opening ceremony, the Divisional Controller, Mr A. R. Cooper (N.W., M. and N. Wales Div.) introduced Councillor Kenyon and Mr Geoffrey Kennedy (Kennedy and Donkin) spoke on behalf of consultants and contractors. Prayers of dedication for the station were said by the Dean of Manchester.

The station consists essentially of a turbine house which will eventually have four in-line 60 MW sets, and an adjoining boiler house with seven 360 klb/hr boilers. Across rail tracks from the boiler house is a semi-circular reserve coal store of 500 ft radius, while the turbine house is adjoined by administration and control buildings, to which it is connected by a 112 ft concrete bridge. There is connection to the Grid through an existing 132 kV outdoor substation situated beyond the low pressure A station, while 33 kV supplies are given for local distribution. Cooling water is provided by 3·5 million g.p.h. cooling towers, of which there will eventually be three. The station when complete will operate on two-shift work.

Boiler Plant

Simon-Carves high head natural circulation boilers with p.f. firing are installed. Rated at 360 klb/hr, they deliver steam at 950 lb/sq in., 925° F. Each boiler has two drums, and is provided with "Melesco" self-draining type superheaters. These are in three horizontal sections. The boiler is designed for corner firing, with three burners in each corner. Steam temperature is controlled by tilting the burners, with further control possible by operation of gas by-pass dampers. Kent equipment operating from a thermocouple gives automatic control of those functions.

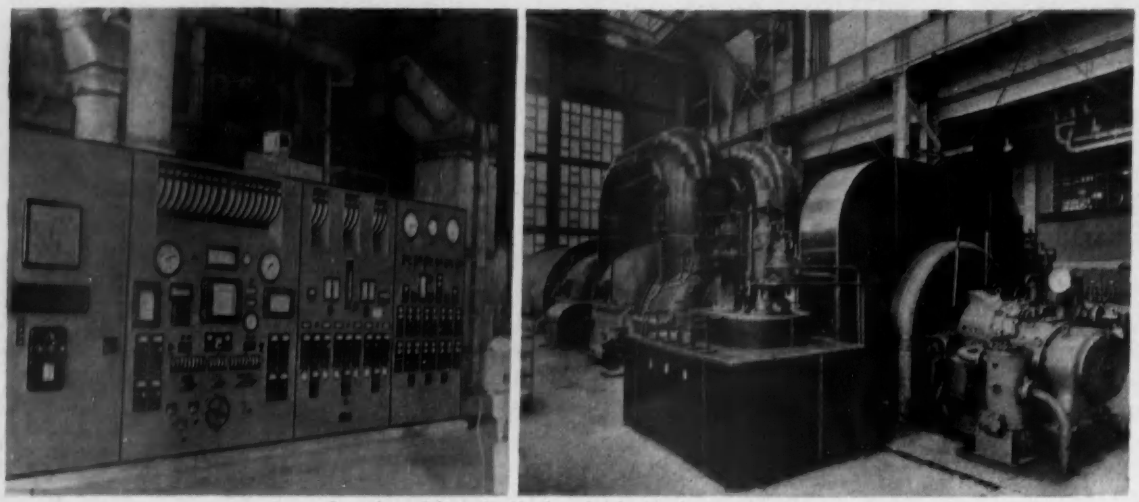
Senior economisers and Howden Ljungstrom air heaters are installed. Feed water final temperature is 380° F. Electroflo pneumatic equipment is installed for the automatic control of each boiler. Three pulverising mills are provided for each boiler, and there are two forced draught and two induced draught fans.

Active volume of each boiler is 25,450 cu ft, and the heat release rate is 18,600 B.Th.U./cu ft/hr at m.c.r. Each boiler will give m.c.r. output comfortably on two mill sets. The third is kept as standby.

Each pair of boilers is connected to one range, and the ranges are interconnected throughout the station. At present coal from East Midlands and Yorkshire pits is being burned with calorific values of 9,000 B.Th.U/lb and 11,800 B.Th.U/lb respectively. Four of the ultimate seven boilers are now in commission.

Throughout the boilers, bolted joints have been avoided wherever possible. For the purpose of statutory boiler inspection, header caps are burnt off and then re-welded, with considerable gain in availability.

Coal is withdrawn from the reserve store by a radial arm drag scraper plant. Weekly consumption of coal at the station when completed will be about 15,000 tons, and the coal is road and rail borne. 2 x 250 tons per hour conveyors feed into the station and discharge into bunkers having a capacity of 540 tons for each boiler. Furnace ash is handled by hydraulic sluice feeding to an ash sump. Dust and grit, extracted from the electrostatic precipitators, goes to dust receivers prior to wetting in mixers for road disposal. Ash from the sump is also discharged into lorries to low ground some three miles away. It is estimated that this will take eight to nine years to fill.



Control panel for boiler No. 1, and right, No. 1 turbo-alternator

Turbine House

The four hydrogen cooled alternators are rated at 60 MW m.c.r. Sets 1 and 2 have three-cylinder turbines with duplex exhaust. Operating steam conditions are 900 lb/sq in., 900° F, with a designed vacuum of 28·7 in. mercury in the two-pass shell condensers with an inlet water temperature of 65° F. and outlet temperature of 76·6° F. Two-cylinder turbines will be used for sets 3 and 4, which are still to come.

The three-cylinder turbines driving the installed generators are of the initial steam conditions of 900 lb/sq in. 900° F. The high pressure casing is of ½% molybdenum steel, the intermediate-pressure of carbon steel with a cast iron exhaust end and the low-pressure of cast iron. The turbine rotors have eleven stages of h.p. blading, thirteen stages of i.p. blading, and the l.p. blading is in two flows of three stages of impulse blading, with a final double tier Baumann exhaust. All the h.p. discs, and those of stages one to nine of the i.p. are integral with the shafts. The discs of stages 10 to 13 of the i.p. and those of the l.p. are shrunk on. There are five stages of feed water heating, including a de-aerator as the third stage, giving a final feed water temperature of 380° F. The twin-shell condensers to which the turbines exhaust have 60,000 sq ft of cooling surface.

All turbines are provided with turbo-visory equipment showing eccentricity, differential expansion, and axial position of h.p. and l.p. cylinders. With sets kept hot from the range, full load is being picked up in about half an hour.

Alternators are hydrogen cooled with an output of 60 MW, 75 MVA at 11·8 kV and are generally similar in construction to other M-V machines of that type.

Stator frames are of welded steel plate circular in cross section with the four gas coolers arranged longitudinally between the core and the outer casing of the stator. Bearings are incorporated in strongly reinforced endshields and the oil seals are of the thrust face type.

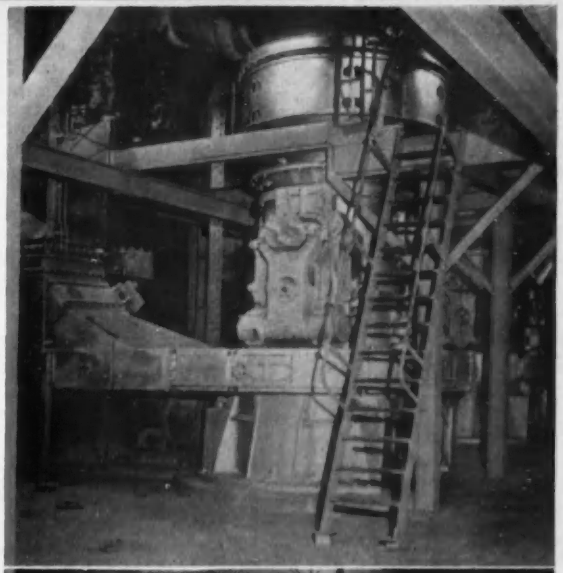
Hydrogen at a pressure of ½ lb/sq in. acts as the cooling medium and is forced through the stator ventilation ducts by propeller type fans mounted on the ends of the rotor. The field winding is ventilated by an interconnected system of axial slots in the rotor body. After passing through the stator and rotor the hydrogen is directed over the cooler tubes through which water circulates and then re-directed through the machine.

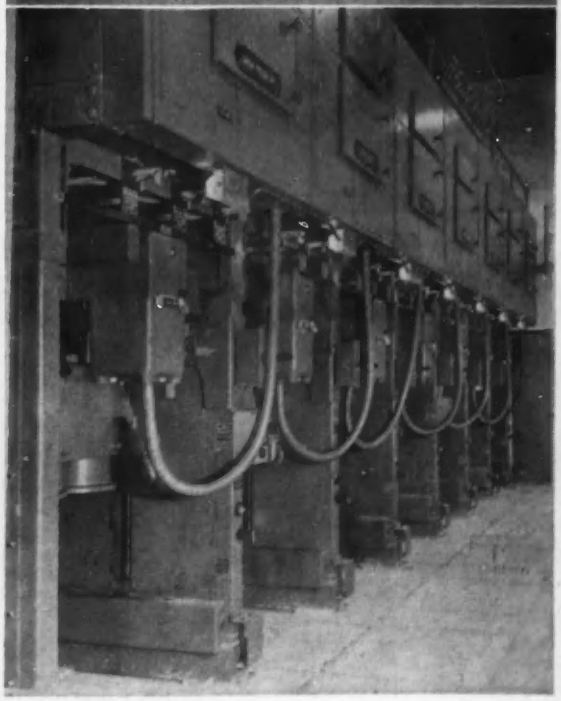
The stator winding is of the involute type and the rotor winding is of silicon-bearing copper strap wound on edge.

Excitation is from a direct-connected exciter supplied from a pilot exciter having its armature overhung from the main exciter shaft. The exciters and the generator sliprings are all contained in a separate housing which provides for ready access and observation. Ventilation air for the exciters is drawn into the housing through a filter.

Auxiliaries include six electrically-driven boiler feed pumps, and three steam driven. All feed pumps have a capacity of 600 klb/hr. Circulating water for the condensers is handled by two pumps for each set, the quantity of water per set being 5,000 g.p.m. There are two electrically-driven extraction pumps for each machine, capable of handling the full load condensate. Surface inter-

Part of the 23 panel power source central board and alternator control desk





General view of switchgear control room and administrative buildings at Chadderton "B" power station with right, a view of the boiler house basement showing pulverising mills. Below is a 7 panel type VTP13/3 kV 1500 MVA power source switchboard, controlling the main station switchgear

cooling type air ejectors per set are provided, together with a quick-start ejector. Auxiliaries for each turbine are operated as a unit on the boiler up to the de-aerator. Beyond that, there is a common feed to all boilers.

Make-up water for the cooling circuit is obtained from the Oldham Corporation's sewage works, and for the boilers from the town's supply. A chlorination plant designed for automatic intermittent operation injects into the suction side of the circulating water pumps. Three sand filter and base exchange units of 500 g.p.h. handle make-up water for the boilers.

The turbine house crane has a span of 60 ft and a maximum load of 120 tons. The auxiliary hook lifts 15 tons.

Electrical Connections

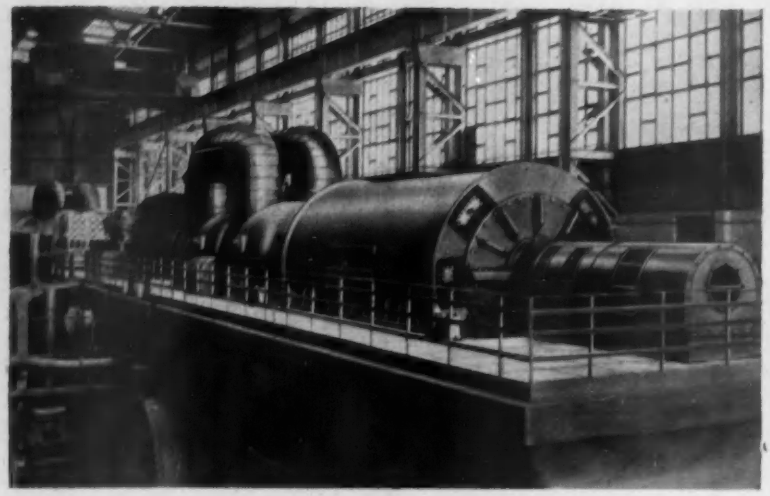
Each set is connected to a 72 MVA transformer and to a 6 MVA unit transformer. Existing generating transformers have a 33 kV secondary, and connect with the A station distribution, while future units have 132 kV secondaries and feed directly to the Grid.

Unit transformers are delta/delta wound, OFW cooling, with on load tap changing gear. The 10 MW station transformers and the "unit" transformers are both delta/star ON cooling, the forming having on-load and the latter off-circuit tap changing.

33 kV switchgear comprises two duplicate busbar switchboards of 1,500 MVA rating (Ferguson Pailin) housed in separate switchrooms adjacent to the administration block. Busbars are interconnected by cables. The switchboards control two generators and associated transformers, two Grid transformers, two 10 MVA 33/3·3 kV station transformers and two inter-bus transformers connecting to the A station. Four further circuits connect through air core cast-in-concrete reactors to single busbar 500 MVA distribution switchboards feeding local substations of the North Western Electricity Board. All switchboards are of the vertically isolated phase segregated design. Switching operations and alternator load adjustments are carried out from a centralised control room in the administration block. This houses corridor type control and relay boards.

The bridge already mentioned leads from the control room and administration building into the station at turbine operating floor level, between Nos. 2 and 3 sets, and opposite the boiler house lift.

Station switchgear is arranged in a long panel at one side of the turbine house, boards being provided for both unit and "station" supplies at 3·3 kV and 440 V. It is usual to run one set of auxiliaries (all are duplicated) from



Turbo-alternator sets 1 and 2. The turbine control board is seen between the steam ends of the two sets

the unit transformer and the other from the house bars. The larger auxiliary drives include feed pumps 1,380 h.p., 3·3 kV motors; f.d. fans 134 h.p., i.d. fans 231 h.p.

Cold cathode lighting is installed in the main control room, which has a lay light with roof lights for normal daylight purposes.

Civil Work

Approximate dimensions of the main station building are 515 ft x 320 ft. Some 9,000 tons of steel were used, and 7,000 piles averaging 40 ft in length were driven into the clay subsoil. The ground consisted of one foot top soil, three to four ft of sandy clay with patches of running sand, followed by soft clay at depths varying from six to ten feet. In all the main buildings, rafts of beam and slab construction spanning between pile caps are used for foundations.

When the station is completed, there will be two 365 ft high chimneys each weighing 8,500 tons. The cooling towers are 310 ft high, with a diameter at the base of 210 ft and 137 ft at the rim.

Turbine house and boiler house are faced externally with golden-brown sand-filled rustic bricks, with pre-cast concrete framed windows. The turbine house has white tiles to a height of seven feet, and white brickwork above. The station is spacious, its total volume of 76 cu ft/kW being amongst the biggest figures noted in the Beaver committee report on "Economy in the Construction of Power Stations."

MAIN CONTRACTORS AND PRINCIPAL SUB-CONTRACTORS

Boilers, ash and dust-handling plant, precipitators and coal-handling plant	Simon-Carves Ltd.
P. F. Mills	International Combustion.
Turbo-alternators, feed heating, de-aerators and evaporating plant	Metropolitan-Vickers Electrical Co., Ltd.
H.L. and L.P. pipework ...	Stewarts and Lloyds Ltd.
Circulating water pumps and boiler feed pumps and mulsifyre equipment	Mather and Platt Ltd.
Automatic boiler control ...	Electroflo Meters Ltd.
Low pressure valves	J. Blakeborough.
High pressure valves	Hopkinsons Ltd.
33 kV power source switchgear	Ferguson Pailin Ltd.
Main step up, unit and station transformers	Metropolitan-Vickers Electrical Co., Ltd.
3·3 kV switchgear for auxiliaries	English Electric Co., Ltd.
Auxiliary transformers	Bonar Long Co., Ltd. Electric Construction Co., Ltd.
Main, auxiliary and control cables ...	Enfield Cables Ltd.
Group starter boards for auxiliaries ...	Brookhirst Switchgear Ltd. Contactor Switchgear Ltd.
Lighting and heating	North Western E.B.
Batteries	Tungstone Products Ltd.
Operational telephones	Clifford and Snell Ltd.
Internal telephones	S.T.C.
Cabling and wiring	W. H. Smith Ltd.
Fire fighting equipment	Walter Kidde Co., Ltd. Mather and Platt Ltd.

Tester for Moisture in Insulation

PREVIOUS work by the E.R.A. on investigations having as their goal improved methods for assessing the electrical condition of insulation had shown that measurement of the admittance of specimens under test in the frequency range 0·05 to 50 c/s appeared to give both the sensitivity and response to localised moisture that was required. Reports have already been published discussing this work and describing a capacitance bridge specially developed for this purpose. A further development is now recorded in Report V/T 121, which describes a simpler method of measurement and a portable instrument developed for testing insulation.

Simpler methods of measurement followed from the discovery that the measurement of the actual admittance of the specimen was unnecessary, and that, for paper insulation at least, the variation of shunt capacitance with frequency was a sufficiently sensitive measure of moisture content. This property, the relative increase in instantaneous capacitance, is known as dielectric dispersion. By working with square waves instead of sine waves, dispersion may be measured directly.

The meter developed for direct measurement, although required to have the same sensitivity of the bridge, is considerably simple in both construction and use, and measures in effect the variation of the instantaneous capacitance of the specimen with the time of application of the square wave, over the range of 70 pF to 0·35 μF. Two modes of operation are possible, the first determining dispersion as the ratio of recovery voltage to the charging of voltage for three conditions, and the second as the ratio of the isolation voltage to charging voltage. Charging and discharging pulses are generated by multi-vibrators and applied to the specimen through a diode switching circuit, whilst a valve voltmeter arrangement is employed for observing the voltages on the system.

A companion report, V/T 124, describes the E.R.A. dispersion meter, Model 2, being an instruction manual for its operation and use. A complete circuit diagram of the unit is given, together with details of adjustments necessary, calibration procedures and methods of checking.

The Measurement of High Voltage

Part III—Errors in Impulse Voltage Measurements Arising from the Inductive Loop Between the Divider and the Test Object

By P. R. HOWARD, B.Sc.(Eng.), A.M.I.E.E.*

IF accurate measurements are to be made of the impulse voltage applied to the test object, e.g. transformer, cable sample, bushing insulator, etc., the divider should be placed close to the equipment under test and the connections arranged so that only the voltage developed across the equipment is recorded. This means that the earth from the divider should be connected to the earthy end of the test object and should be independent of the main impulse circuit earth; if the divider is connected to the main earth at the generator, then the inductive drop ($L\,di/dt$) in the earth lead between the test object and the generator will be recorded as well as the voltage across the equipment under test.

In general it is not practicable to locate the voltage divider very close to the test object, because either of the size of the test object or the possibility of distortion of the electric field of the object under test (for example a bushing) by the proximity of the divider. When adequate separation between the test object and divider is achieved the circuit can be represented by Fig. 1, where "L" is the inductance of the loop formed between the divider and the test object, and "R" and "C" in parallel is a generalised representation of the divider; for a capacitor divider "R" is infinite, and for a resistor divider, "C" represents the earth-capacitance. With the impulse generator connected to point "A" (impulses should never be applied to the point "B" because it is impossible to predict the voltage appearing across the test object unless its equivalent impedance is known), the voltage wave recorded by the divider with a uniformly rising voltage output ($v=a_o t$) from the generator can be expressed in operational form as:

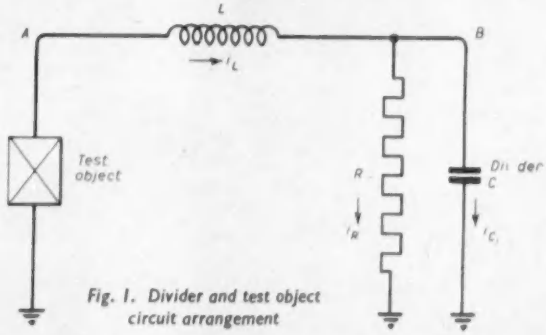


Fig. 1. Divider and test object circuit arrangement

$$\frac{a_o/LC}{p(p^2+p/RC+1/LC)} \qquad \text{.....(1)}$$

and, as a function of time, for ω_o greater than θ, the voltage is:

$$a_o t\left(1-\frac{L}{2Rt}-\frac{\varepsilon^{-\theta t}\sin\omega t}{\omega t}\right) \qquad \text{.....(2)}$$

where $\omega=\sqrt{\left(\frac{1}{LC}-\frac{1}{4R^2C^2}\right)}$ and $\theta=\frac{1}{2RC}$

*Mr Howard is with the Electricity Division, National Physical Laboratory. Previous parts of this series were published in our issues of 14th April and 19th May.

With typical circuit arrangements the maximum value of the term $(\varepsilon^{-\theta t}\sin\omega t)/\omega t$ is very much greater than $L/2Rt$, and the recorded wave is the true wave with superimposed damped oscillations. With a capacitor divider ($R=\infty$) equation (2) becomes

$$a_o t\left(1-\frac{\sin\omega t}{\omega t}\right) \qquad \text{.....(3)}$$

The undamped oscillations which occur from this circuit condition can be heavily attenuated by means of a resistor introduced between the divider and the test object. This resistance decreases the peak value and increases the wavefront of the recorded wave, but it can be shown that the errors are very small if

$$R_D C \ll 1/\beta$$

where R_D = the resistance inserted (ohms)
C = the capacitance of divider (farads)
β = the constant in the expression for the impulse wave $A(\varepsilon^{-\alpha t}-\varepsilon^{-\beta t})$; for a 1/50 microsec wave $1/\beta=1{\cdot}7\times10^{-7}$ sec.

The determination of the breakdown voltage of protective devices such as surge diverters, or the plotting of breakdown voltage/time characteristics for various kinds of insulating materials for co-ordination purposes calls for voltage measurements to be made with impulses which are chopped before the peak of the wave is reached. It has already been shown that for these conditions the simple resistor divider is not very suitable and must be replaced either by a capacitor divider or a resistor divider compensated for the effects of earth capacitance; serious recording errors can also arise from the circuit arrangement referred to above.

TABLE I

Time to chop t_1 (Microsec)	Capacitance of divider (10^{-12} F)	Inductance of loop (10^{-6} H)	Percentage Error $\frac{CL}{2t_1^2}\cdot 100$
0·1	300	40	60·0
0·25	300	40	9·6
0·5	300	40	2·4
1·0	300	40	0·6

If flashover of the test object occurs at a time t_1, then, prior to flashover,

$$i_L=i_R+i_C=i_R+C\frac{dv}{dt} \qquad \text{.....(4)}$$

where v is the voltage on the divider, and i_L, i_R and i_C are the currents shown in Fig. 1.

After flashover of the test object, the voltage at the point A is zero and $\frac{di}{dt}L=\frac{-v}{L}$ therefore i_L decreases but still flows in the same direction, so that v continues to rise until i_L becomes equal to i_R. Suppose that the total rise of voltage is δv ($\delta v \ll v$), and that $\delta i_R \ll \delta i_L$, then

$$\frac{di_C}{dt}=\frac{di_L}{dt}=-\frac{v}{L}=-\frac{a_o t_1}{L} \qquad \text{.....(5)}$$

Initially $i_L=i_R+Ca_o$ (from equation 4) and therefore i_L drops to i_R (an amount Ca_o) in a time CL/t_1 since $di/dt=$

$-a_o t_1/L$. The average value of the inductive current during this interval is $\frac{Ca_o}{2}$ so that the rise in voltage δv is given by

$$\delta v = \frac{i_L \text{ (average)} \times \text{time}}{C} = \frac{Ca_o}{2} \cdot \frac{CL}{t_1} \cdot \frac{1}{C} = \frac{a_o CL}{2t_1}$$

The fractional error introduced is $\delta v/v$ and this is equal to $CL/2t_1^2$. This expression is applicable to all types of dividers, and is clearly most serious in the case of the capacitor divider.

The voltage recorded by a divider under the conditions considered is too high; Table I gives the theoretical errors at various chopping times for a circuit having a capacitance of 300×10^{-12}F and an inductive loop of 40×10^{-6}H. The simplified treatment of the problem has been verified experimentally.

This concludes the articles on H.V. Measurement by Mr Howard. The previous articles were published in our issues of 14th April and 19th May.

Rotating Machinery Ratings

Continuous Maximum Rating basis adopted in New British Standards

FOUR important electrical machinery standards are replaced by one with the publication recently of B.S. 2613: 1955 "The Electrical Performance of Rotating Electrical Machinery." The standards replaced dealt with industrial generators and motors (B.S. 168) and various aspects of large generators and motors (B.S. 169, 225 and 226). In addition to combining the four standards, several significant changes have been made in the interests of conformity with present day practice.

Continuous Maximum Rating

Most important of these changes is the exclusive recognition of continuous maximum rating for all motors which exceed 50 h.p. per 1,000 r.p.m. Continuous maximum rating is defined in the standard as "a state of operating limits assigned to the machine by the manufacturer, defining the load at which the machine may be operated for an unlimited period under the conditions specified on the rating plate, while complying with the requirements of this standard. Such a machine is not capable of carrying sustained overloads." At present, open, protected and pipe-ventilated motors which are rated at not more than 50 h.p. per 1,000 r.p.m. continue to be specified on a load-with-overload basis (c.p. B.S. 168: 1936), but the Foreword to the standard draws attention to the fact that this anomaly will disappear with the next revision, which will coincide with the introduction of a revised classification of insulating materials. It is expected that the classification will be finalised within about twelve months. In the meantime, the continuous maximum rating of these smaller motors is recognised as a matter for special arrangement between the parties concerned.

TABLE I TOLERANCES

Item	*Tolerances*
Efficiency	
(*a*) By summation of losses in accordance with BS 269*	0·1 of $(100-\eta)$
(*b*) By input-output test	0·15 of $(100-\eta)$, with a minimum of 0·7 per cent where η is the guaranteed efficiency expressed as a percentage.
Declared losses of synchronous condensers	+ 10 per cent.
Power factor of induction machines	$\frac{1}{8}$ of (1-cos ϕ) Min. 0·02 Max. 0·07 where cos ϕ is the guaranteed power-factor expressed as a decimal.
	h.p. per 1,000 r.p.m.
Speed of d.c. shunt wound or compound wound motors (at rated load and at working temperature).	Below 3 ± 10 per cent Not less than 3 but below 10 ±7·5 per cent 10 and upwards ± 5 per cent
Speed of d.c. series-wound motors (at rated load and at working temperature).	Below 3 ± 15 per cent Not less than 3 but below 10 ± 10 per cent 10 and upwards ±7·5 per cent
Slip of induction machines	+40 per cent of the guaranteed slip.
Starting torque.	−10 per cent of the guaranteed starting torque.
Starting current of squirrel-cage induction motors and of synchronous motors with solid pole shoes or with starting windings of squirrel-cage type	Up to and including 100 h.p.: +20 per cent of the guaranteed starting current. Above 100 h.p.: +15 per cent of the guaranteed starting current.
Transient and sub-transient reactances of synchronous machines	±30 per cent of the guaranteed value unless otherwise agreed.

*BS 269, "Rules for methods of declaring efficiency of electrical machinery (excluding traction motors)."

Temperature Rise

The tables giving details of permissible temperature-rise have been completely recast, and for each type of winding a method of temperature measurement is now specified. The various requirements appertaining to electrical performance are stated and the tests required to demonstrate that the performance requirements are achieved, are specified.

Four types of machine enclosure are covered by the standard—open, protected, pipe or duct ventilated and totally enclosed. There are sub-divisions for each type, and approved letter symbols for these are now stated.

Momentary Overloads

The section dealing with momentary overloads provides for a 15 second test period. Generators, for instance, have to carry a 50% excess current for this period. There are more detailed requirements for motors, the excess torques which are required to be withstood ranging from 100% for a.c. induction motors up to 50 h.p. and being as low as 35% for synchronous induction motors. Motors complying with the class "continuous rating permitting overloads" are required to carry 25% overload in torque for periods varying from 15 minutes to 2 hours according to their size.

High voltage tests required for motors largely follow previous standards.

A particularly interesting feature of the standard is a table of tolerances which shall apply when tenders include guarantees for certain figures. This table is shown herewith.

Power on the Farm

ELECTRICITY IN MACHINERY AND EQUIPMENT AT ROYAL SHOW

WOLLATON Park, Nottingham, saw the opening last week in glorious weather of the largest ever (in area) annual show of the Royal Agricultural Society of England. This is the fourth time that this beautiful parkland, now the property of Nottingham Corporation, has seen the Royal, previous events were in 1888, 1915 and in 1928.

Some idea of the task which has confronted the R.A.S.E. in preparing the showground is evident in the nine miles of water piping, the laying of 35,000 railway sleepers for weatherproof roadways, and the installation of 55 miles of electric cable.

This giant electrical installation, almost the equivalent of wiring a town of 4,000 inhabitants, has once again been the task of Dale Electric Ltd., of Filey, Yorks, who, as contractors to the R.A.S.E., started work on the site last October. Both overhead, underground supply cables and the normal installation wiring have been laid and will have to be removed by next September, when the Royal Show transfers to its 1956 site at Newcastle. In addition to the cables and wiring, three substations—2 of 50 kVA and one 300 kVA have been installed.

The Supply Industry Exhibit

Theme of the 12,000 sq ft exhibit organised jointly by the East Midlands Electricity Board and the Electrical Development Association was "Electricity as an aid to crop and animal husbandry." The stand was divided into separate sections devoted to the various facets of farming.

Exhibits in the crop conservation section comprised: In silo and platform grain drying units by G.E.C., including the latest E.R.A. developed multi-purpose grass/grain dryer, a trough conveyor and vertical elevator bearing the "Perry" Farmers Friend brand name, and two Opancol "Quicktest" moisture meters which give accurate readings when the probe is inserted in to the grain storage. Marconi's TF933a moisture meter was also shown. A ventilating unit suitable for 60-ton storage plant displayed was a Mathew and Yates installation employing 9 h.p. motor and 18 kW heater.

Dairy equipment included sterilisers by Woolley (Whizzer and AQS273) and the G.E.C., and 25-gallon and 20-gallon water heaters respectively by these firms. Milk coolers included the Gascoigne Rotofreeze unit, Hall's Model 70 Chillwell, a 100-gallon model by Purlac, Prestcold's CWH110 unit which handles 110 gallons a day, and a Weycroft unit. Electric grooming equipment was represented by Cooper-Stewart's Clipmaster and Shearmaster clippers, and the Flextol EB45 flexible shaft rotary brush with an attendant "Dandyvac" suction cleaner unit. Looking rather like a giant hair clipper the new Atkinson "Silo-Aid," designed for easy cutting of silage, is a tool which employs an oscillating blade to cut straight faces and square corners at a rate of 12 ft a minute. Two semi-complementary units to assist controlled grazing of herds were shown, a Wolseley fencer unit with Varley 6 V battery and a Westinghouse BC13 12/10 battery charger.

Electrical aids to pig keeping were illustrated by a "Loheat" floor warming unit operating on low voltage, infra-red units by G.E.C. and Philips, and a dull emitter type by Laybat, thermostatically-controlled "foster mother" piglet feeders by Arnold and Sons and the Churn Company, and food preparation equipment—G.E.C.'s Genalex 36-gallon 6 kW pressure cooker and a Martin potato steamer. A mincer designed to deal with roots, brassicas and other wet-feed ingredients by Taskers was included, this has high-speed knives revolving at 3,000 r.p.m. in the base of the machine.

There were many other examples of time and labour-saving electrical food-preparation appliances. One machine shown, a Tweedy "Peckmix," minces roots, cabbage, bread, kitchen waste and other such ingredients, and mixes it with meal to give an output of mash up to 3 tons per hour. A Brook 1½ h.p. motor powers the Bentall Maxim root cutter also shown which has a similar output. W. Holland and Co.'s Adelphi food mixer uses a 2 h.p. motor to handle 2 cwt capacity wet or dry and is said to produce a perfect mix without waste in 2-5 minutes. Another self-contained pulping and mincing machine for pig poultry and cattle food is the Opancol Pulpall "A" which is available with 3 or 5 h.p. flange motor and by a special attachment can be converted to a hammer mill. Especially designed as a hammer mill is the "Essex" machine by Christy and Norris, average outputs from this machine range from 2-4¼ cwt/hr for oats, beans and barley. Again a 3 h.p. motor is used. Two other examples in this section were a Martin's "Comet-Mix" automatic mill outfit, a 1 h.p. motorised unit which is said to be ideal for smaller farms or smallholdings, and the Mixator 5-cwt vertical mixer combines a mixer-elevator and bulk loader.

Wolseley Engineering have introduced this fencer post barrow for easy installation of electric fence system, and right, a 3 h.p. combined milling outfit by Martins

In the poultry section incubators and brooders of various sizes by Curfew Appliances, Stephens, and Cope and Cope, indicated the successful application of electricity as heating mediums under thermostatic control. The Stephens model employed auto turning arranged for operating at 1, 1½ or 3 hr intervals. An Eltex dull emitter piglet warmer and G.E.C. single lamp l.v. heater were displayed as independent heat sources. Two time switches shown were the Venner MPDC for a synchronous pattern and the English Clocks model which has twin circuit allowing choice of high or low voltage lamps.

The farm workshop can be profitably electrified and the appropriate stand section showed some of the power tools by Blach and Decker, and Wolf Tools. An arc welder which will find great use in the workshop is the English Electric Arc Welder LWC200 which has a maximum continuous welding current of 142 amp. The current range is 30-57 amp at 90 V and 59-200 amp at 160 V in 24 steps. The Tarpen "Tarplaner" is another time-saving tool shown along with an Acrow Farm sawbench and a B.E.N. portable compressor unit (PX5) which will provide air for spraying, spray painting and tyre inflation. In the section devoted to horticulture an enclosed propagating frame by the Agricultural Supply Co. was displayed as suitable for use in cold or heated greenhouses. An Asco two-light model Dutch light seen on the stand is suitable for growing early salads with a soil warming unit by the same people. A "Loheat" 1 kVA low voltage transformer and G.E.C.'s HO5112 soil steriliser were included in the display. Units for the control of heating were the Proscon air stem type thermostat and the Rheostatic Co.'s WTO air thermostat.

Water supplies for the farm were illustrated by a display including Worthington Simpson's auto pressure pump set which gives mains pressure from a well source. For shallow wells there was the Lister domestic pump giving 250 g.p.h. Other types included units by Mono Pumps, James Beresford, Godwin and Broadwall.

A large proportion of the equipment shown on the "electricity" stand was shown again by the manufacturers on their own individual stands.

Crop Conservation

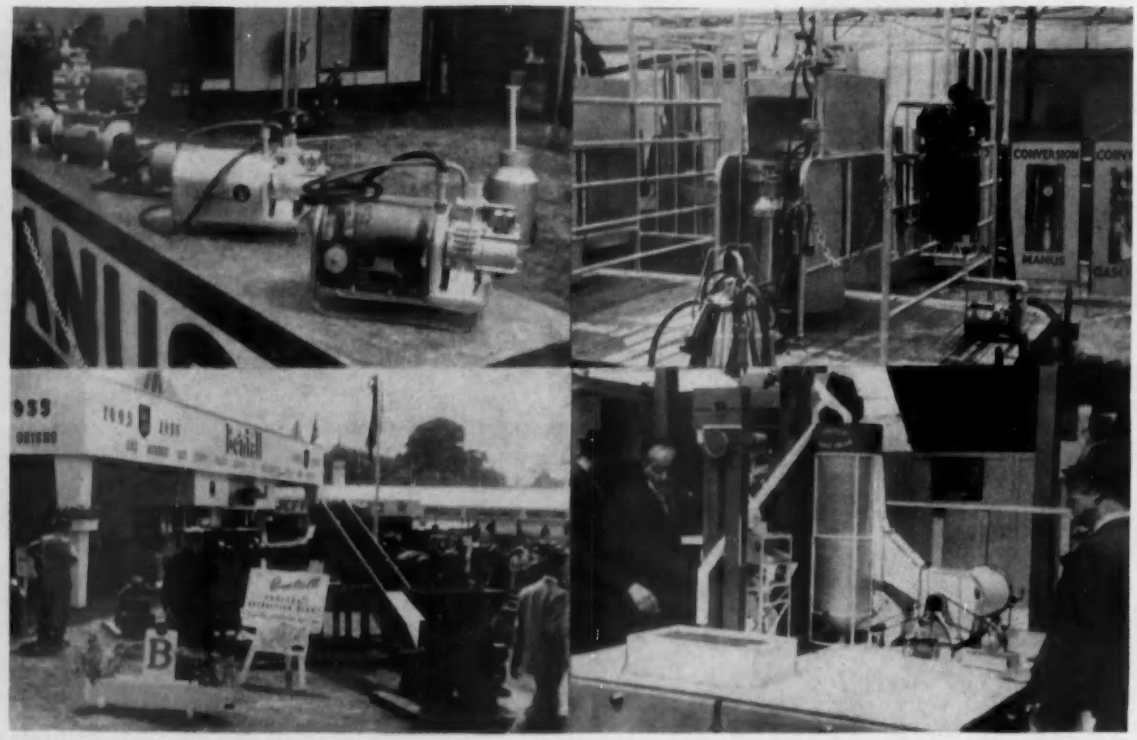
A giant provender press couplied to a grain hopper, elevator and attendant mixing machine dominated the Templewood Engineering Stand. This installation included five motors of varying sizes and provides the larger farm with a means of blending meals before mixing. The mixer itself is a 10/15 cwt unit which is belt-driven from a totally-enclosed 5 h.p. motor, in this instance of English Electric make. The Mark I grass/grain dryer, also shown, can be arranged for coke, coal or oil firing with electric motors providing automatic working.

An interesting feature of Penney and Porter's display was the quarter-scale model of a Mark II grain dryer. This large unit is designed for coke or oil heating, but the Mark I dryer is an all-electric unit with a 15 kW heater. This plant is ideal for the small farm, it is easily installed in the barn and provides a means of continuously drying the crop from a small combine harvester.

Lainchbury equipment included the type 4BR bucket grain elevator which handles up to 5 tons of wheat per hr. Motive power is supplied by 1 to 1½ h.p. Brook motors. Conroy grain conveyors in three versions, the Captain (5 tons per hr), Major (6 ton) and Colonel (12 tons) use Brook motors ranging from 1-2½ h.p. according to duty.

New grain handling equipment shown by Mitchell Coleman and Co. includes the T9M3 Tornado pneumatic conveyor which now has 4 castor wheels and an independent pneumatic venturi. Air volume control now makes

Top row, left to right, electric air compressors for milking machinery by Manus and the display set up of Weycroft milking system Bottom row Bentalls prizewinning "Protess" extraction plant and the scale model Lincoln grain dryer featured by Penney and Porter



it possible to use this machine for drying by ventilation.

Also newly designed for the small farm is the Triumph seed and grain cleaner-grader which follows the principle of the Yeoman precleaner.

A scale model of a new multi-purpose crop drier developed by the Electrical Research Association was featured in the General Electric Co.'s display. This employs a G.E.C. duct air heater and a Woods of Colchester, single stage axial flow fan. Second new introduction by G.E.C. at the show is the new greenhouse heater which has wide mesh sides to allow heat from the 750 W or 1,500 W element to pass through. A galvanised trough is fitted on top of the heater which, finished in an attractive shade of green, is selling at £4. 16s. and £5. 18s. for the two models.

Four motors totalling 28 h.p. are used in the new "Protess" protein extraction plant which won for E. H. Bentall and Co. a silver medal in the new implement competition. This installation occupied a prominent corner position amongst milling, mixing and cutting machinery.

Also under this heading comes the display of Scottish Mechanical Light Industries. Scotmec grain blowers are available with built-in motors all fitted with automatic blast control to protect the motor.

Dairy and Cow House

Super purity milk production is greatly assisted by electric power in the dairy. Milking units by Gascoignes included their new "Electronic" controlled pulsator unit which was seen for the first time on the opening day. Impulses are relayed through the master control box to each point and then pneumatically through a booster to the milking cluster. Mains input is transformed to 12 V output for safety, no adjustment is needed to ensure foolproof constant pulsator speed in any ratio 50/50, 60/40, 66, 33, 75/25.

Included amongst the full range of equipment by R. J. Fullwood and Bland was their "Midget" milker which affords a low-price milking machine for farmers keeping small herds. It comprises a small vacuum pump mounted on a cast aluminium base which is hollow and serves as a vacuum tank and silencer capable of operating two standard "Fullwood" units. Drive is from a ½ h.p. motor.

The Weycroft Dairy Equipment display emphasised the advantages of a system combining milking and cooling direct-into-churn. The special milking and cooling head is designed for incorporation into most of the well-known milking systems. Pumped water drives a rotor in the top of the head which revolves agitators steeping into the milk churn whilst cooled water flows over the outside. Brook motors are used to drive both water pump and vacuum pump for milking clusters from the same motor.

The "Impulsator" system now a few years old and featured by Simplex Dairy Equipment embodies the use of a transformer circuit and rectifier to give 12 V d.c. from 230 a.c., which is then flown through a relay switch operated by the vacuum pump motor to give a 2:1 ratio with pulsation at 45-48 per minute.

The comprehensive display by Prestcold included the new UCL cooler and the new Promotor and Vendor frozen food cabinets amongst domestic and commercial refrigerators, conservators and milk cooling gear. Marco Refrigerators similarly provided a representative display of their refrigerators, freezers and service cabinets including the recent Marco Minx Zero Cabinet—a 4 cu ft unit which incorporates a Serviseal condenser unit, also shown individually. Similarly the Frigidaire display was representative of the firm's range of refrigerating equipment.

Steam rising in quantity from the Woolley stand attracted considerable attention to the sterilising chests in operation. Woolley's Electrobloc steam raiser was shown in several models. This company incidentally provides "in sack," "in tray" and "in bin" grain driers for all-electric operation, mixing machines and grain conveyors.

Clipping and grooming machines were shown by Cooper-Stewart Engineering Co. Their Clipmaster and model 31 "Shearmaster" were again featured. The new series of the "Hornmaster" de-horner for de-budding calves and the "Herdmaster" animal coaxer embody improvements gained from laboratory and field work. The latest Mark IV "Fencemaster" unit provides 3 months' trouble-free controlled grazing from its 120 V dry battery.

Electric fencing equipment was convincingly demonstrated by Wolseley Engineering who had a couple of piglets enfolded by units of their system which includes the first British-built all-mains electric fencer. No batteries or transformers are used. Current rating is 5 W at 230 a.c. The fencer barrow which was shown is designed to cut erection and installation time. Frame of the barrow which affords storage capacity for 50 posts and tripods incorpo-

A new greenhouse heater was featured by the General Electric Co. The new milk bottling and capping plant attracted attention on the Perkin's Clean Milk stand, just one week old, the unit has a capacity of 300 g.p.h.

rates two ½ in. diameter vertical pillars on which may be mounted the fencer unit and its battery and the reel.

Pigs and Poultry

Curfew Appliances, who make a range of brooders, hovers, and incubators, introduced a new Curfew Junior egg-washing machine which is available power driven. Their 2 heat dull emitter infra-red rearers were also new to the Royal Show. Among the VisiChick Brooder Co. display were many items of interest. The recent hot-air circulator developed for the small greenhouse has two 400 W elements. A larger version is the hot-water tubular type greenhouse heater available in five sizes. Designed to provide a quick and inexpensive cure for cannibalism amongst birds is the electric de-beaker which sears and cauterises the top mandible in a quick action. The full range of "Glevum" poultry appliances by Stephens Cabinet Incubator Co. included a 12,000 pre-heated cabinet incubator, a contact heat brooder which is adjustable for chick growth, and a battery brooder.

Food Preparation

The name of Christy and Norris Ltd. has long been associated with grain and fodder milling and grinding machinery. On their stand they included the familiar 3 h.p. Essex Major mill, a Briton B7/2 grinder which is shown coupled to a 15 h.p. motor, which has an output 5 times that of the Essex mill.

Fyna Industries "Farmers" mill was entered in the Implement competition and awarded a silver medal. Its design simplifies servicing with new self-locating bearings and fan housings which enable rotor, fan, etc., to be removed and replaced in minutes. The screens are leak-proof and placed above the rotor whilst the under-feed suction intake helps reduce vibration by lowering the centre of gravity.

Workshop Power and Pumping

A stationary electric chain saw capable of cutting timbers up to 7 ft in diameter was the most dramatic exhibit by Teles Smith Ltd. who have a complete range of portable and stationary chain saw equipment. New products since the last exhibition shown by Black and Decker Ltd. included the 5 in. portable saw attachment, a screwdriver attachment and a paint mixer. New Wolf Electric Tool introduction were the AGT/9 heavy-duty high-speed angle grinder, designed to operate the new depressed centre reinforced grinding disc.

Featured at the entrance to the A. C. Morison stand, suspended in mid-air and in circuit with a cluster of lamp bulbs, was the renowned Minor plant which can be carried by a young girl yet provides 350 W output, enough to provide lighting for a small dwelling.

The new T53 diesel engine produced as an industrial power unit by R. L. Engineers Ltd., a joint Rootes Group/R. A. Lister company, was featured by Listers for the first time. It was shown direct coupled to a MacFarlane Magnicor 40 kW alternator. The engine develops its rated horsepower of 66 b.h.p. for 12 hours continuously.

An exhibit attracting attention on the British Thomson-Houston Co.'s stand was a demonstration working exhibit of the "Stavolt" close regulation alternator driven by a diesel engine. It has been developed for providing a.c. supplies to small outlying communities. Pyrobar agricultural electric heaters and both fractional and larger h.p. motors in the B.T.H. range were shown fitted to appropriate equipment and supplied by the "Stavolt."

Sigmund Pumps introduced at the show the new series of self-priming centrifugal contractors type pumps which are designed for electric, petrol or diesel drive. Also new were the Duojet Rainmasters just introduced into the Sigmund range of rotary sprayers.

Workman Reed had three new diesel generator sets on view. These were the Super Beacon "L" 1,500 W unit incorporating a Lister power unit, the Super Beacon "RY" 3,000 W and 6,000 W mains voltage fully automatic sets incorporating the latest YB6 and 2YB Ruston water-cooled diesels. These Ruston and Hornby units have been joined this year by a new "YC" vertical range in powers of 16-72 b.h.p. and a new HRO horizontal oil engine.

Gilbert Gilkes and Gordon had a comprehensive display of power-driven pumps. Whilst farm and domestic needs were catered for special emphasis was laid on high pressure washdown facilities. Important introduction of interest to horticulturists and gardening enthusiasts is the new Tarpen "Tarpentiller," a power-operated hoe with a chain saw attachment. Displays and demonstration of Kenwood appliances, a "window" model of the Hoover washing machine in operation to show the water action along with the other Hoover home aids were, like the twin-room Eize Kitchen's display of built-in equipment, an attraction to the women folk.

WATER POLLUTION RESEARCH

A NEW Laboratory, designed by and erected under the supervision of the Ministry of Works to provide new premises for the Water Pollution Division of the Department of Scientific and Industrial Research, is situated at Elder Way, Stevenage New Town, Herts.

The main block consists of a three storey building with small scale laboratories on ground and first floors, and administrative quarters, library and small conference room on the second floor. Constant temperature rooms, stores and a canteen are also accommodated on the ground floor. The single floor east wing, which accommodates four large pilot scale and fourteen small scale laboratories, is built in load bearing brickwork and roofed with precast prestressed concrete units.

Heating throughout the main block is by a low pressure hot water system with radiators which, in the laboratories, are concealed behind mahogany benches with built-in convection grilles. The bench upstands incorporate gas, compressed air, water and electrical power points at frequent intervals, together with impulse points giving one second and thirty second impulses for use with special laboratory apparatus. The impulsing is actuated by the master clock in the Messengers' Room which also serves a number of slave dials throughout the buildings; a special contact is fitted to the clock mechanism to give one second impulses. Lighting is mainly by louvred fluorescent fittings. There are special tungsten lighting fittings in rooms such as the Board room and the library.

The constant temperature rooms range from 50° C to 40° C and are equipped with refrigerated cooling units and mineral insulated cable heating panels, the whole being controlled by multi-contact thermostats. A multi-channel temperature indicator with selector switch enables room temperatures to be checked from the adjacent plant room.

False ceilings are extensively used in the corridors of these two buildings and conceal the electrical services, G.P.O. wiring and extract ducting from the fume cupboards. Fluorescent lighting fittings are mounted on the hinged trap doors which give access to the false ceiling.

Electricity at 11 kV is brought to the site and is stepped down through a 500 kVA transformer to 415/240 V, 3-phase, 50 cycles. L.T. switchgear is provided for local distribution. Road lighting on the site is by 3 ft high concrete bollards with directional bull's-eye lanterns.

notes on wiring

by Megohm

SUMMER days are often referred to as "salad days," but I usually find that my tomatoes, which are regarded as an essential ingredient for a salad, are either not ripe enough or have mysteriously vanished. However, a short walk across the fields to a group of glasshouses soon remedies this matter, and on a recent call I found the owner in rather a happy mood. Electricity had just been laid on to the premises and he could foresee the end of working by oil lamps during the winter months and the possibilities of simpler methods of soil sterilisation. I had discussed the methods of lighting the various storerooms, etc., and was pleased to see that he had taken note of my recommendations.

Catenary Wiring Systems

The storerooms and house had been dealt with in the normal way and a good workmanlike job had been done. The glasshouses, however, were a different matter. Each of them was some 200 ft in length and approximately 25 ft wide with a centre path or walkway 3 ft wide. The gables were very substantially made and consisted of steel sections and brick with large windows. There were also steel supports at three equal distances along the length of each house. It was explained to me by the owner that these precautions were taken because of the heavy weight of the tomatoes. This, of course, assisted greatly in the choice of system for lighting these houses. The catenary wiring system was employed and a most satisfactory result was obtained.

One standard box is used and this may be applied to angle, tee or through joints and can even accommodate three 30 A fuses and a neutral link if required. Lighting fittings can be suspended from the box. The cable can be suspended in spans up to 170 ft but it is usual to provide some intermediate supports, especially above fittings. The spans are made up on the ground and then erected and this avoids the difficulty of working at high levels. The boxes also act as anchor boxes and are designed to anchor the steel cable at terminations, at right angles and mid-span positions.

In this particular installation, the drops to the switches were run in conduit and galvanised wire used at each roof truss to support the fittings. Cables can be supplied with 2, 3, 4 or 6 cores in sizes from 3/·029 to 19/·064, and I noticed that use had been made of the multi-core type to provide two lights in the yard between the main house and the first greenhouse. The end terminations had been made secure by means of metal plates on either side of the gable brickwork and the whole installation was neat, tidy and showed much care by the contractor.

Shocks from Water Taps

I have read with interest the letters on the above subject in our "Problems and Practice" page, and I recall an incident which occurred during my apprentice days. A telephone call to our office one morning reported that tenants were receiving electric shocks from water taps and even kitchen tables! When we arrived at the houses in question, a block of four on a housing estate, we were invited to turn on the water taps and find out for ourselves. We did so, and received quite a severe electric shock. One tenant invited us to take some knives, etc., from a metal kitchen table and again we received a shock. Three tenants only complained of the shocks whilst the fourth was quite sure that nothing was wrong.

We started our investigations and found that the wiring in the three houses was quite in order but the water piping was still "alive." We practically had to force our way into the fourth house because "there was nothing wrong" and a spectacle in the way of how not to do it met our eyes. The son had decided to wire up some electric fires in the bedroom and had done the wiring in flexible cord purchased from a chain store. The cord had been stapled to the woodwork and taken through the door frames. Four fires had been wired in this manner and served from a 30 amp d.p. ironclad switchfuse. The cords, where they entered the switchfuse, had been subjected to some strain with the result that due to the inferior insulation on the cords there was a leakage to the metal frame of the switchfuse. Also the water pipes were laid in such a way that three houses of one block and one house of the next were served by one main pipe and this meant that the house unaffected by the leakage was served by the water main from next door, but the conduit system had been bonded to the water pipe of the house above. We could not gain access to the house in the next block to find out if any shocks had been received by the occupants.

Needless to say a strongly-worded report went in to the local housing authority on the subject of wiring by amateurs and perhaps this occasion was the start of my feelings towards these people who fool around with electricity to the danger of others.

Careers in the Contracting Industry

The foregoing are only two of the many matters which one meets in the contracting side of the electrical industry. Many more were covered by the Paper read at the recent Power Convention and which was summarised in a previous issue. The responsibility of the electrical contractor was emphasised and it would appear to me that more notice should be taken by the employer of this when engaging a new apprentice. A word in this direction from one of the senior men would, I feel sure, make an impression on the young lad starting off on his career.

The different craftsmen of the industry are discussed in the paper and the work done by maintenance men, armature winders and repair workers. In all a very interesting and helpful paper and one which I feel would be eagerly read by those lads who are joining the industry with a mind to getting to the top.

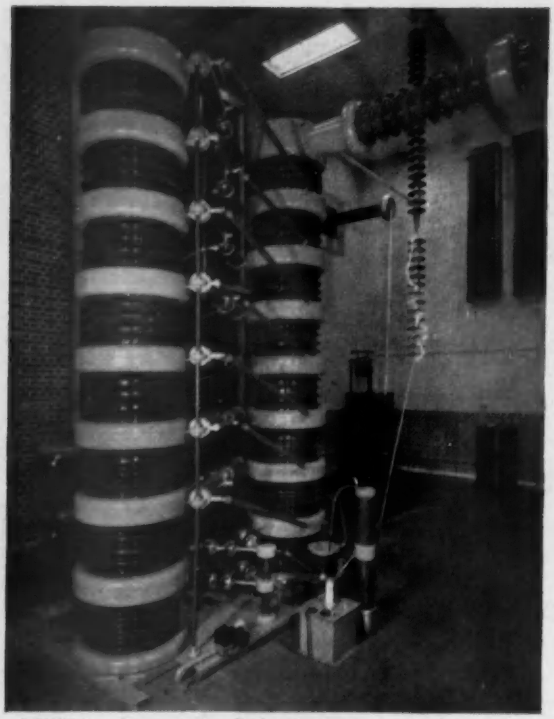
Laboratory Facilities for the Central Electricity Authority

New Leatherhead Extensions now in full Operation

IT became apparent in the early years of operation of the 132 kV Grid system, that a central laboratory was required to deal with day-to-day problems of high voltage transmission which was at that time new to this country. The then Central Electricity Board established a laboratory at Waddon, near Croydon, for this purpose in 1932, and as one of the major problems was the breakdown of insulators in industrial areas, a high-voltage insulator testing station was established at Croydon in 1934. Further expansion was prevented by the outbreak of war, and in the event, the Waddon Laboratory was rendered unusable by enemy action in August 1940. The work was accordingly transferred to Leatherhead where some land was available adjacent to the Central Electricity Board's 132 kV substation. The 250 kV high-voltage test equipment was also transferred to Leatherhead, and from this nucleus has developed the present laboratory. In 1948, the laboratories were transferred to the B.E.A. (later the C.E.A.) and their scope greatly increased as their function was extended to cover the generating divisions and the boards with their problems of generation and distribution, as well as transmission.

A new building was started in June 1948, and by the end of 1949 was in use, but although the work carried out was invaluable, the accommodation still proved inadequate, and further extensions were begun and completed in 1955. These extensions were opened on Tuesday, 5 July, by Lord Citrine, chairman of the Central Electricity Authority.

Electrostatic precipitator pilot plant for tube type investigations



1·4 MV impulse generator discharging across an insulator string

New Building

The extensions consist of a three-storey wing connected with the main building. On the ground floor, there are the mechanical engineering, generating plant, generation research and electrical plant laboratories. The first floor contains an analytical chemistry and general main laboratories, with subsidiary sections devoted to meteorology, light, particle mechanics, X-ray diffraction, radiation heat, ceramics, oil, corrosion and metallurgy. The second floor comprises electronics and instruments and a conference room which is equipped to be used as a lecture theatre if necessary and has an associated projector room.

Comprehensive power supplies are laid on to every laboratory, ring-circuits and 13-amp fused plugs being extensively used for single-phase normal supply circuits. D.C. of various voltages and 3-phase a.c. supplies can also be made readily available at any specific point.

Dr J. S. Forrest, Director of Research, speaking at a recent press visit to the laboratories, emphasised that the primary function of the organisation was to deal quickly and efficiently with problems as they arose. There was therefore no clash with the co-operative research bodies whose intent was mainly directed to long-term research and development, and where the initiation of a new research project could take a considerable time. It had also been the policy to develop the laboratory facilities as problems arose, not to establish well equipped and expensive laboratories and then look round for work which could be undertaken.

Work in Hand

The work in hand is particularly extensive. In the high voltage field—the laboratory is equipped with a 1·4 MV impulse generator—experiments are being carried out on the design and operating features of the 132 and 275 kV grid systems, particular attention being paid to life of insulator bushings, insulators and system co-ordination.

The high voltage section is provided with portable equipment to allow for field testing. Data is also still being derived from the experimental high voltage line (250-500 kV between phases) which has been erected near the laboratory site.

Protection and communication equipment is investigated by the electronics and instruments section, which is also responsible for the design and building of special "one-off" equipments used in other research functions, such as fault recording, thunderstorm recording and so forth.

In the generation section, attention has been mainly devoted to special plant difficulties such as vibration, rotor winding failures, performance of cooling towers and electrostatic precipitation. Two pilot plants have been installed for study of the fundamental mechanics of electrostatic precipitation, one at Leatherhead of the tubular type, and one at Croydon B power station using actual flue gas, of the plate type.

Physics and Chemistry

The physics section is concerned with general physical problems such as flame radiation, heat transfer, fluid flow and particle-size analysis, and investigations are also in progress on semi-conducting ceramic glazes particularly in connection with the improvement of insulator performance.

A general view of part of the electronics section

Radiography is widely used for the examination of castings, bushings and other equipment, both X-ray and gamma-radiography being available. As the performance and operation of power systems are greatly dependent on weather, a meteorological laboratory has been provided and is equipped with instruments to provide weather data of interest in other investigations.

Chemical work includes research on fire-side deposits in boilers, the corrosion of steels at high temperatures, the corrosion of overhead-line conductors and underground cable sheaths and various other problems in metallurgy and ceramics. Work is also carried out on insulating and lubricating oils, and apparatus is available for accelerated oxidation tests and for assessing the effectiveness of anti-oxidants in transformer and insulating oils.

Testing of materials in general is carried out by the mechanical section who are naturally most interested in the strength of overhead line conductors and fittings, and the assessment of conductor deterioration. Research is also carried out on the vibration and fatigue strength of overhead line conductors and turbine blading.

General services provided include a photographic section which processes oscillographic, spectrographic, radiographic and X-ray diffraction films and plates. In addition photographs of special instruments and plant breakdowns are taken for record purposes and reports. A photocopying service is provided, and photomicrographic work is undertaken. Special techniques such as cine photography, infra-red photography and phase-contrast microscopy are used for investigational purposes.

Mention has already been made of the experimental high-voltage transmission line erected near the Laboratories. This consists of two 1,200 ft spans of conductor supported from special steel gantries 120 ft wide. The phase separation and the disposition of the earth wires can be varied to permit the line being used for investigations at voltages of from 250 to 500 kV (between phases). The normal phase separation is 32 ft 6 in., and provision is made for various arrangements of single and twin conductors. Two earth wires at a separation of 49 ft are strung 20 ft vertically above the phase conductors. The line insulation normally consists of cap-and-pin units, the string length being altered when necessary to suit the voltage being used. Measurements are made at 275 kV and 380 kV to ascertain the power loss due to corona and insulator leakage in various weather conditions. The radio-interfering field from the line is also being investigated. The mechanical performance of the line is being studied, and vibration recording devices are attached to the conductors. Meteorological instruments giving continuous records of air temperature, humidity, rainfall and rate-of-rainfall are installed at the experimental line site.

Croydon Insulator Testing Station

Outdoor testing equipment is installed at Croydon so that life tests can be made on insulators at voltages up to 250 kV under conditions closely simulating those of actual service in industrial districts. Line insulators are suspended from special test towers, and other types of insulator and equipment are erected at ground level on gantries and test racks. The performance of the insulators is under continuous supervision by means of instruments which record the leakage current and count the leakage current surges. Work is in progress on insulators with semi-conducting ceramic glaze, oil-bath insulators, new insulating materials, and methods of live insulator washing.

An interesting feature of the construction of the Leatherhead laboratories is the incorporation of Panelec floor-embedded heating cables. A total loading of 112 kW is provided, with thermostatic control for off-peak operation.

A section of the general physics laboratory is shown in this photograph. In the bottom right foreground can be seen one of the standard power supply units

I.E.C. Ceremonies in London

Inaugural Le Maistre Memorial Lecture Delivered

THE London meeting of the International Electro-Technical Commission, which ended in London on Friday, was made the occasion for the first of the lectures which have been founded to commemorate the work of Charles le Maistre, for 49 years general secretary of the I.E.C. Appropriately, this first lecture bore the title "Charles le Maistre: his work, the I.E.C.," and was delivered by M. André Lange, a prominent French electrical engineer who was a close friend of le Maistre.

M. Lange recalled that le Maistre was 30 years old when the formation of the I.E.C. was proposed at the St. Louis Electrical Congress of 1881. Standardisation was regarded in many quarters with deep suspicion, as being liable to curb inventiveness. Le Maistre set out to overcome all hesitations and mental reservations by exerting his great powers of patience and persuasion. At first he had to carry out his duties by correspondence, and he did so by letters warmly personal in tone, written in English or in French as necessary. He also developed a special skill in advising the technical committees that were set up, and in organising their smooth working. Finally, beyond committee work, he developed the conference technique as a means of putting questions of general importance before wider audiences. At such conferences he put forward the advantages that could accrue from standardisation, and proved so successful that he found himself called upon to take part in the setting up of standard organisations for industries other than the electrical. "Charles le Maistre" concluded M. Lange, "was in truth the architect of international standardisation."

Dr H. S. Osborne, retiring president, and Dr. S. Dunsheath, new president of the I.E.C. in conversation

One incidental result of international standardisation work is better understanding between different countries. This is a specific branch of scientific work generally, for it has always overstepped national boundaries. The ultimate aim of the work of the I.E.C. is the unification of national standards on the basis of its own published recommendations. This unification is achieved step by step only, but as soon as an I.E.C. recommendation appears, it crystallises the state of knowledge as recognised at the time concerned by a large group of countries. Le Maistre forwarded this process by helping engineers of different countries to help to know and respect one another.

Summing up, M. Lange suggested that le Maistre was one of the few who at the beginning of the century foresaw the part that international co-operation could play in electrical development. In his early successes he found justification for continued effort. Difficulties he met with a light heart, and this in turn strengthened his resolution and stimulated him to carry through plans in their entirety. In one of his last letters, Lord Kelvin wrote that the work of the I.E.C. was surely destined to bear good fruit throughout the world. This, M. Lange suggests, may be said with equal truth of Charles le Maistre.

At the close of the lecture M. Lange was warmly thanked by Professor J. A. di Artigas (President of the Spanish National Committee of the I.E.C.) and General E. Wiener (President of the Belgian Electrotechnical Committee) and was presented with a momento of the occasion, in the form of a piece of silver-plate, by Dr Percy Dunsheath, then Honorary Treasurer and now President of I.E.C.

Guildhall Banquet

Highlight of the programme of the International Electrotechnical Commission's meeting in London was a banquet last Tuesday at the Guildhall, arranged by the British Standards Institution and under the chairmanship of Sir Roger Duncalfe. The toast of "the Lord Mayor and the Corporation of London" was proposed by Viscount Waverley who referred to the traditional atmosphere of the surroundings and thanked the Corporation for enabling the banquet to be held in the Guildhall. After a reply by the Lord Mayor, Sir Seymour Howard, in which he welcomed the delegates to the City, The President of the Board of Trade, Mr Peter Thorneycroft, proposed "The International Electrotechnical Commission." He spoke to the theme that human progress is not a steady even progress and at the moment we are experiencing a dynamic surge forward. With the development of atomic energy and the possibility of the automatic factory, a new industrial revolution will be experienced in the second half of this century. The years that lie ahead will bring exceptional opportunities and it is the responsibility of all nations to use them wisely. Much can be done by co-operation and the recent agreement with the United States on the civil use of atomic power is one example. It is the Governments' role to create the conditions which enable these great changes to go forward smoothly. Finally, he spoke of the need of freedom in industry, stressing that the conditions of the 1930's do not persist today. If our outlook and our policies are shaped by the constant fear of a slump then we shall move backwards not forwards.

The reply to the toast was by the I.E.C. President, Dr H. S. Osborne, who is retiring this year after a three-year term. A special tribute to his work was paid by the chairman.

New President

Dr Dunsheath was unanimously elected President of the I.E.C. at a meeting of the Council held at British Standards House on Friday afternoon last. Dr Dunsheath succeeds Dr Harold Osborne (U.S.A.).

ELECTRIC TRACTION FOR EXPORT

English Electric's Preston works provides complete facilities for building units up to more than 3,500 h.p.

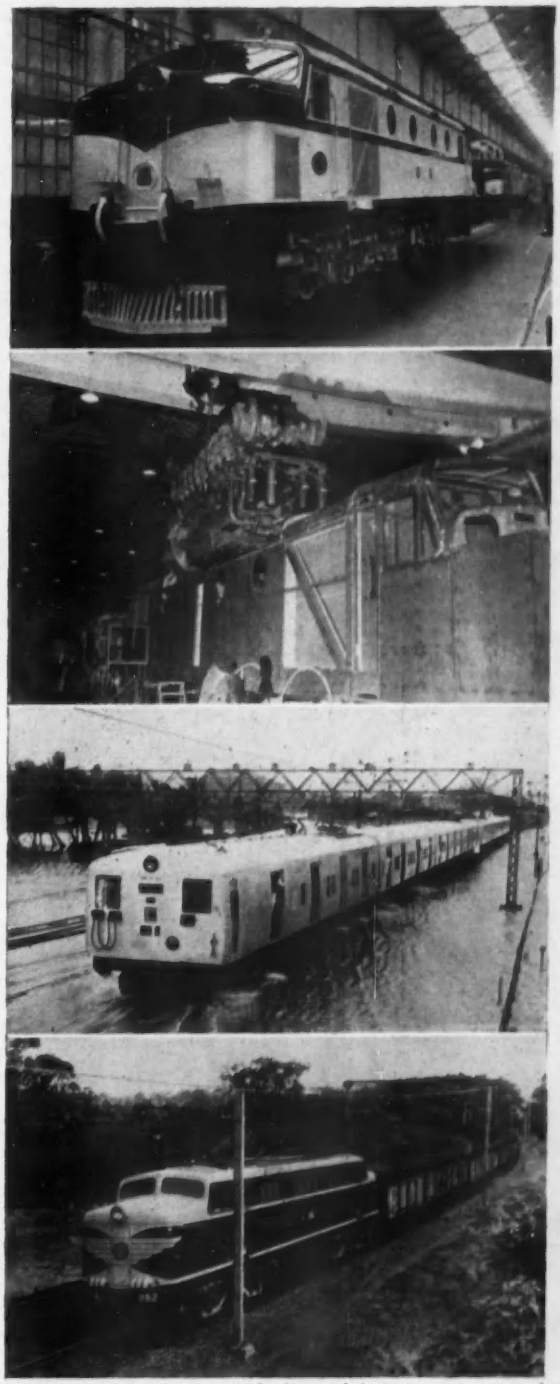
SO fundamental is the importance of efficient rail transport in national economy that the rapid expansion of many overseas countries since the war has given rise to an almost unprecedented demand for both electric and diesel-electric traction equipment from British manufacturers. What this has meant for one prominent firm in this field, the English Electric Co., was indicated on a visit last Friday to their Preston works where their manufacture of such equipment is concentrated.

During the visit attention centred naturally on several 2,000 h.p. diesel-electric locomotives under construction for the Rhodesian Government Railways. Its power unit is a 16 cylinder, V form, turbo-pressure charged diesel engine derated to 1,750 h.p. and driving a 1,320 kW, 850 r.p.m. generator supplying 1,750 A at 750 V. It employs a 1 Co-Co 1 wheel arrangement—two triple axle bogies, driven on each axle, supplemented by a Bissel bogie at each end to reduce the axle loading.

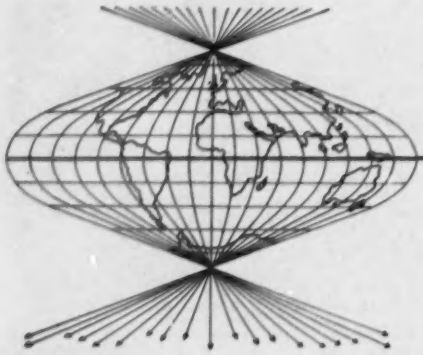
In construction, the main loco frame is initially fabricated in the inverted position to enable underframe fixing attachments to be welded in position without difficulty. Bogies, similarly are assembled, initially, upside down. The framework of the body and cab superstructure at each end, are built up as sub-assemblies which are then lifted on to the main frame after it has been mounted on the bogies. It is during this part of the construction that the complete power unit is fixed in position.

The tour of the works encompassed the construction of all major electrical and mechanical equipment since the works is equipped to make the complete locomotive under one roof. Apart from traction equipment, the works is also concerned with the production of diesel generating sets, including a number of mobile units up to 500 kVA in size, and mounted as a complete generating station on a covered trailer.

During the last half-century, the company has supplied 76 railway systems in 29 countries with electric and diesel-electric equipment ranging in size from 350 h.p. to 3,600 h.p. Since the war they have supplied some 750 MW of traction units. Notable in this not inconsiderable output were the 1,760 h.p. diesel-electric locos, 10,000 and 10,001 operating between London and Scotland, followed by two units of comparable size for the Southern Region. Of particular interest in equipment sent overseas were 1·4 kV d.c. motor coach trains for the Bombay suburban services, in which the electrical equipment was specially waterproofed up to 30 in. above rail level to enable trains to run through monsoon flood water 8 in. above rail level at speeds up to 5 m.p.h.



Efficient rail transport is of fundamental importance to economic expansion and the above pictures indicate some of the locomotives supplied by the English Electric Co. to countries overseas. The top two show views of one of the 23, 2,000 h.p. diesel electric locomotives for the Rhodesian Government Railways, depicting the completed loco and, below, the 16 cylinder, turbo-pressure charged diesel power unit and generator being lowered into the loco frame. The third picture shows a 1·4 kV, d.c. motor coach train under monsoon conditions on the Bombay suburban system. Depicted in the bottom picture is a 2,400 h.p., 1·5 kV d.c. main line locomotive on the Victorian Government Railways, one of 25 units supplied for hauling heavy freight and passenger trains between Melbourne and Traralgon



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

New Cable Concern

A new company just formed to manufacture in Canada a range of telephone wires and cables, is jointly owned by the Canada Wire and Cable Co., Ltd., General Cable Corporation of New York, and the Telegraph Construction and Maintenance Co., Ltd., of Gt. Britain. The company, whose title is Telecables and Wires Ltd. will be managed by the Canada Wire and Cable Co. Its board of directors is composed of Mr I. T. Bennett (chief executive officer, General Cable Corpn., New York), Mr J. R. Bradfield (president, Canada Wire and Cable Co.), Mr J. N. Dean (chairman, Telegraph Construction and Maintenance Co.), Mr L. G. Lumbers (vice-president, Canada Wire and Cable Co.), Mr J. R. MacDonald (president, General Cable Corpn.), and Mr O. W. Titus (vice-president and general manager, Canada Wire and Cable Co.). Plans are now being prepared for the erection of a factory for which an option on a site at Fort Garry, a suburb of Winnipeg, Manitoba, have been obtained.

Funds for Development

To meet the growing demand for power the Great Lakes Power Corpn. Ltd., which supplies an area in West Ontario, has begun a development programme to increase its installed capacity by 88,000 h.p. to a total of 231,000 h.p. The company has six hydro-electric stations, all interconnected by over 193 miles of transmission line. The first stage of the development plan is estimated to cost $3¼m, most of which will be met from cash resources and retained earnings. But to obtain further finance $4¼m of debentures have been issued.

U.S.A.

Dixon-Yates Decision

The controversial Dixon-Yates power contract is to be cancelled. President Eisenhower has given instructions to this effect this week on receiving assurances from the Mayor of Memphis, Tennessee, that the city will proceed with the construction of its own generating plant. This will obviate the necessity for the proposed Dixon-Yates power station across the Mississippi at West Memphis, which was to have compensated the T.V.A. grid for a nuclear plant in the area.

CENTRAL AMERICA

Loan Needed

The plan of the Mexican Light and Power Co. to install a new 75 MW steam generating set at its Lecheria plant has been approved by the Mexican Government. The company propose to seek a loan of about $10 millions from the World Bank for the purpose, and hopes to place orders for the new set and its associated boiler within the next few months. The new unit, which will be the largest of its type in Mexico, is scheduled for operation by the end of 1957. Mr W. H. Draper, jnr., chairman of the board, also states that the El Durazno and San Bartolo hydro-electric plants of the Federal Electricity Commission, to which we referred on 16 June, should add 43 MW to the available generating capacity in the near future, and the Commission's Tingambato station is scheduled for initial operation about the end of next year.

Dollar Loan for Nicaragua

Two new World Bank loans totalling $7·5 millions will help finance a power project which will double electric generating capacity in Nicaragua and help to meet demands for power in the Managua and Pacific coastal plain areas. The project includes the construction of a 30,000 kW thermal power plant in Managua, transmission lines to 15 outlying towns, and expansion of the distribution systems in Managua and the towns. It marks the transition of the Nicaragua power industry from the phase of scattered diesel plants to that of an organised power network with facilities capable of satisfying an expanding market. Both loans are guaranteed by the Government of Nicaragua and are for a term of 20 years, bearing interest of 4¼% including the Bank's usual 1% commission. The Bank of America of San Francisco is participating in the loan without the World Bank's guarantee to the extent of $724,000, representing the first five maturities falling due semi-annually from Oct. 1, 1958, to Oct. 1, 1960. One loan for $7·1 millions, which will pay for imported equipment, materials and services needed to build the new power plant and transmission lines, has been made to the Empresa Nacional Luz y Fuerza of Managua, a Government-owned corporation. The other loan for $400,000 which is to defray foreign exchange costs in expanding distribution systems in outlying towns has been made to the Instituto de Fomento Nacional, a Government agency.

SOUTH AMERICA

Caroni H.E. Project

Tenders have to be submitted this week for the main contract in Venezuela's Caroni hydro-electric scheme, on which great store is set in the plan to provide adequate electricity supplies for the expanding industry. Preliminary work on the Caroni project, on the Caroni River, was completed during the last dry season. The present stage is for the installation of three sets of 50 MW at 35 metre head with 70 MVA generators in view of the substantial variation in the head of water available at the Caroni Falls. According to the project programme, the first machine is scheduled for operation by Dec., 1957. It is likely that the second stage will be for a further three sets. Consulting engineers for the project are Sir William Halcrow and Partners. Power from the scheme is intended partly for industry, and the production of steel, for which a new plant is being established.

PORTUGAL

More Power

Portugal's new hydro-electric power station at Canicada, of the Companhia Hidro-Electrica do Cavado, was formally inaugurated recently. The station has two 30,000 kVA generators. It operates on water from the Cavado-Rabagao Rivers system, which is accumulated in a storage basin of about 130 million cu metres capacity.

S. AFRICA

Union's Power Outlook

Capital expenditure by 1975 on the additional 3,600 MW of plant which would be needed to supply the increased electricity consumers of municipal undertakings in the Union would amount to £470m, according to Mr D. J. Hugo, city electrical engineer of Pretoria. He gave this forecast in his presidential address to the Association of Municipal Electricity Undertakings of Southern Africa recently. Anticipating an average

annual increase in consumption of 8%, he estimated that in the next 20 years the amount of generating and distribution equipment needed would be four times the present installed capacity. No municipality was in a position to incur the unpredictable expenditure on nuclear power stations, which would make more substantial inroads on capital resources than the conventional coal-fired types, he said. The training and acquisition of engineering personnel would probably become a great problem, for in the tremendous development in engineering and industrial expansion throughout the Commonwealth, South Africa had been the hardest hit.

EGYPT

Cable Manufacture

A new concern to manufacture wires and cables in Egypt has been set up near Cairo with the assistance of two French companies. The new concern, whose title is the Electric Cable Co. of Egypt, has recently opened new works at Mostorod to produce all types of wire and cable, bare or insulated with rubber, plastic and cotton. The two French concerns associated with the project are the Société Electro-Cable de Paris and Les Trefileries et Laminoirs du Havre, who between them have taken up 49% of the capital. At the present time Egypt imports cables and wires to a value of near £3m annually, and in view of development plans which are progressing it is likely that the demand for such goods will soon rise.

S.W. ASIA

Future Outlook

Pakistan's coal resources are very limited and the grade inferior, while hydro-power resources are situated at one end of the country making it necessary to erect lengthy, and costly, transmission lines. Dr Nazir Ahmed, chairman of the Pakistan Atomic Energy Committee, therefore believes that the use of nuclear energy has opened up a bright new prospect of solving the power problem in Pakistan. He agrees that the fortunate discovery of the Sui gas field has no doubt relieved the situation, but is not a complete solution of the difficulties. For that reason it is proposed to obtain in the first instance, an experimental atomic pile with which men can be trained and be ready for larger developments. A geological survey is also to be carried out for radio-active minerals.

More Cable

India's state-owned telephone cable factory at Rupnarainpur, West Bengal is to double its production of armoured cables to meet all requirements of the Posts and Telegraphs Department. The concern, Hindustan Cables, which went into production toward the end of last year, was set up for the Government of India by Standard Telephones and Cables Ltd. It is designed to produce on a single-shift basis, 90 miles of unarmoured and 380 miles of armoured telephone cable annually. That planned capacity was based on the schedule of requirements prepared by the Posts and Telegraphs Department in 1950. Since then, however, there has been a considerable increase in the department's demand, and their requirements are now put at over 800 miles of armoured cable per year. In consequence, it has now been decided to double the armouring capacity of the factory by installing additional equipment. This expansion scheme, which is to be completed by Sept., 1956, will cost about Rs.750,000, and will enable the factory to meet the entire requirements of the P. and T. Dept. by introducing additional shifts in all the shops if necessary.

Power Plans

The Madhya Pradesh State Government is understood to have formulated a scheme to add 150 MW to its generating capacity in the second Five-Year Plan. The scheme includes an additional 30,000 kW at Khaperkhed power station and a new station of 30,000 kW at Akola. The total installed capacity in the State at the end of the first Five-Year Plan is expected to be 105,700 kW.

AUSTRALIA

Tasmania's Demand

Over 67% of domestic consumers in Tasmania use electricity for cooking and over 51% for hot water, according to the annual report of the Hydro-Electric Commission of Tasmania, just to hand. At 30 June, 1954, there were 53,552 electric cookers and 41,167 water heaters connected, over 4,000 of each being added during the twelve months covered by the report. Units sold to retail consumers increased by 12%, 493 million units, to which must be added 709·8 million units sold in bulk to major industries. Power developments are already in hand which are expected to be sufficient to meet the normal growth in demand until 1961 or 1962, but looking further ahead investigations are proceeding on possible new power schemes. Several alternatives are being considered for utilisation of the River Derwent below Waigatmah, while further survey work has been carried out on the Huon river. For other likely schemes, river flow recorders have been installed on the King Franklin, Murchison, Mackintosh, Mersey and Forth.

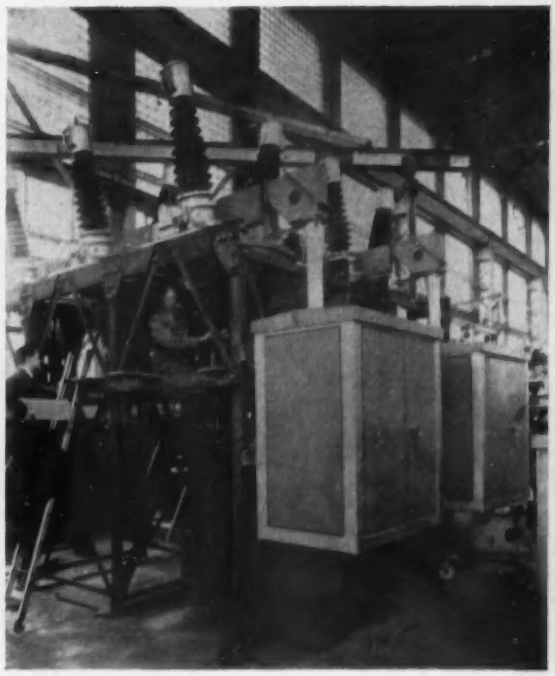
Nuclear Development

A contract for a 10 MW research nuclear reactor for the Australian Atomic Energy Commission at Lucas Heights, near Sydney, has been placed with Head Wrightson Processes Ltd. Value of the contract is put at £750,000. It is the first British contract for the construction of a nuclear reactor for export to be announced. Head Wrightson Processes are in the group which form the Nuclear Power Plant Co., with which C. A. Parsons and Co., and A. Reyrolle and Co. are also associated.

THAILAND

Reversion in Bangkok?

The Thailand Government is considering making changes in the organisation of the public utilities which it nationalised some time ago. With the object of increasing efficiency and reducing operating costs it is proposed that certain of the undertakings should be converted into companies in which the government, the public and in some cases the municipalities concerned would hold shares. The Bangkok Electricity Works has been included in a list of such undertakings which may be changed in this way.



One of ten 66 kV, 1,000 MVA type OW, 407 oil circuit-breakers being supplied by the British Thomson - Houston Co. for the Wallerawang power station of the Electricity Commission of New South Wales, is seen alongside in course of manufacture at the B.T.H. Willesden Works. For this power station that company is also supplying four 30 MW turbo - alternators, with magnestat voltage regulators, four 32·5 MVA, 11/132 kV generator transformers, two 10 MVA, 132/3·3 kV transformer interconnector units, all with on-load top changing, and eleven 132 kV, 2,500 MVA oil circuit-breakers. Seven of the latter have already been completed at the firm's Willesden Works

Personalities

IN THE INDUSTRY

Sir Harold Bishop, C.B.E., F.C.I.S., B.SC. (ENG.), M.I.E.E., M.I.MECH.E., F.I.R.E., director of technical services, B.B.C., has been elected president of the Electrical Industries Benevolent Association for the ensuing year. At the annual general meeting of the Association last year, **Mr H. A. Deacon** was re-appointed chairman of the Court, and **Mr R. H. Coates** and **Mr Ernest Long** were elected additional Court members.

Mr S. A. Hasan has been appointed director of the Power and Electrical Branch in the Central Engineering Authority of Pakistan. He joined that Authority in 1950 as a deputy director.

Sir John Hacking, M.I.E.E., A.M.AMER., I.E.E., consultant with Merz and McLellan, arrived in Salisbury, Southern Rhodesia, last week. At the request of Lord Malvern, the Prime Minister, he is to advise the Federal Government of Rhodesia and Nyasaland on electricity legislation and the co-ordination of electricity supplies. The Government is considering the establishment of an Electricity Commission. Sir John is expected to stay about five weeks studying the local conditions.

Mr Dennis Freedman has been appointed to the board of directors of Kenwood Manufacturing Co., Ltd.

Mr Bryan Donkin, B.A. (Cantab)., M.I.E.E., M.AMER. I.E.E., M.SOC., C.E. (France) has accepted the invitation of the executive council of the Association of Supervising Electrical Engineers to continue in office as President of the association for a further term. The new national chairman of the A.S.E.E. is **Mr R. F. Mathieson,** ASSOC.I.E.E., London sales manager of the Electrical Apparatus Co., Ltd. Mr Donkin, a partner in the firm of Kennedy and Donkin, consulting engineers, has been mainly concerned with high voltage lines and substations for the C.E.B. and the C.E.A., particularly the latest 275 kV super-grid. He is also interested in combined generation of heat and electricity for industrial purposes and for district heating. Mr R. F. Mathieson, who has been London sales manager to the Electrical Apparatus Co., Ltd. since 1946, joined that firm in 1938 as Birmingham area sales manager. Earlier he was Midland area sales engineer for the E.M.B. Co., Ltd. for two years, after gaining experience with the Midland Electric Installation Co., Ltd.

Mr J. D. Nicholson, B.SC., A.M.I.E.E., chief engineer to the Yorkshire Electricity Board, has been nominated by the I.E.E. and appointed a member of the Leeds-Hull Academic Board set up by the Minister of Education in 1946 under the jurisdiction of the Yorkshire Council for Further Education.

Appointed deputy station superintendent at Marchwood generating station, Southern Division C.E.A. with effect from 1 Aug. is **Mr D. G. Clarke,** A.M.I.E.E. who since Mar. 1953 has held a similar post at the South Western Division's East Yelland power station. Earlier he was operation and efficiency engineer at Bromborough generating station, after a period at Staythorpe. From 1947 to 1950 he was at Fulham generating station, first as electrical test engineer and later as boiler house charge engineer. For the two years previously he was with the Portsmouth undertaking.

Mr Alan L. Paget, B.SC., A.C.G.I., has retired from the General Electric Co., Ltd., where he has edited the *G.E.C. Journal* since 1939. Educated at St Paul's School, he studied engineering at the City and Guilds College, and after war service, served a graduate apprenticeship with the B.T.H. Co. at Rugby, and subsequently held posts in the Contract and Export Departments. Going overseas for further experience, to the G.E. of America, he worked for a year in various factories before being appointed to a position in the Research Laboratory under Dr Whitney. Deciding to take up technical publicity, he joined an advertising agency in New York City and, on returning to England, worked for some time with the Press and General Publicity Service in London. During his retirement he intends to continue actively in free-lance technical and general journalism, we understand. The new editor of the *G.E.C. Journal* is **Mr B. K. Cooper,** who, for a number of years, was on the editorial staff of the *Railway Gazette*, latterly as assistant editor.

To celebrate the 25th anniversary of her appointment as lady supervisor of Rowlands Electrical Accessories Ltd., **Mrs Winnifred Lawrence** was last Thursday presented with a silver fruit dish and

Mr Scott Adie makes the presentation

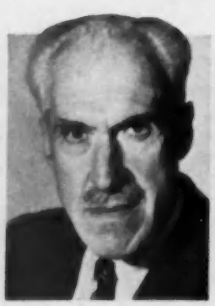
a cheque by **Mr Scott Adie,** chairman of the company, at an informal cocktail party held at the Farcroft Hotel, Birmingham. A number of other long service awards were also made.

The Postmaster-General, with the approval of the Prime Minister, has appointed **Sir Gordon Radley,** C.B.E., B.SC., PH.D., M.I.E.E., to be Director-General of

Mr Bryan Donkin

Mr R. F. Mathieson

Mr D. G. Clarke



Mr A. L. Paget

Sir Gordon Radley

the Post Office in succession to **Sir Alexander Little,** who is retiring on September 30 at the age of 60. **Mr R. J. P. Harvey** and **Mr S. D. Sargent** are appointed deputy directors-general in succession to Sir Gordon Radley and **Sir Dudley Lumley,** who is 60 and is retiring on August 31. Sir Gordon Radley, who is 57 years of age, is the first engineer to become director-general. He has been a deputy director-general since last Oct. and before that was engineer-in-chief for three years. In that capacity he had final responsibility on this side of the Atlantic for the design of the first transatlantic telephone cable which H.M.T.S. *Monarch* is now in the actual process of laying. Mr Harvey, a native of Edinburgh, aged 50, will be responsible for telecommunications. For some years he was head of the inland telecommunications department until his recent appointment as director of radio and accommodation. Mr Sargent, at present director of postal services, is 48. In 1946 and 1947 he was deputy chief administrative officer with the Control Commission, Germany. Later, for some years, he was director of personnel for the Post Office. In his new post he will be responsible for postal and personnel matters. It is also stated that **Sir Ben Barnett,** a deputy director-general, will continue to devote all his attention to broadcasting.

Mr J. M. Crabbe has been appointed a director of the East African Power and Lighting Co.

Dr Percy Dunsheath was elected president of the International Electrotechnical Commission at a meeting of the council last Friday. He succeeds **Dr Harold S. Osborne,** whose three-year term of office has expired.

The Admiralty has announced that **Captain K. H. T. Peard** is to be promoted Rear-Admiral and appointed director of the Naval Electrical Department in succession to **Rear-Admiral Sir Philip Clarke,** with effect from August 17. Rear-Admiral Peard, who is 53, assumed the duties of deputy director of the Naval Electrical Department (Personnel) in Dec., 1949. From Jan., 1953, to Jan., 1955, he was Captain of H.M.S. *Collingwood,* the naval electrical school.

The new manager of the electricity showrooms at Urmston of the North Western Electricity Board is **Mr T. Johnson,** who has succeeded **Mr D. Jones,** now showroom supervisor at Warrington.

Recently elected directors of the Garrard Engineering and Manufacturing Co. Ltd. are **Messrs W. Butler, J. Tyldesley** and **Kenneth Slade.**

Two new area managers for "His Master's Voice" radio and television sales are announced. **Mr S. E. Jennings** has been appointed area manager for Scotland and North East England. Mr Jennings has been associated with companies now in the E.M.I. Group since 1923, when he joined the Columbia Gramophone Co., Ltd., from Pathe-Freres. Since 1945 he has been "His Master's Voice" sales supervisor for the Manchester district, North East England and the Eastern areas of Scotland, covered by the resident sales representative, Mr R. P. Longhurst. **Mr P. H. Evans** has been appointed area manager of North West England and North Wales. Mr Evans has served with companies of the E.M.I. Group since joining the Columbia Gramophone Co., Ltd., from the Edison Bell Co. in 1932, and since 1945 has been "His Master's Voice" sales supervisor for North West England and North Wales.

The Ministry of Supply has announced that **Dr R. Cockburn,** O.B.E., M.SC., PH.D., A.M.I.E.E., has been appointed deputy controller of electronics in succession to **Rear-Admiral G. Burghard,** whose tour of duty has expired.

Mr G. A. Dickins, B.SC., F.INST. PET., is now assistant manager of the Technical Department of the Vacuum Oil Co.'s headquarters in London. He was formerly superintendent of the company's central laboratories, at Wandsworth, which position is now being filled by **Mr V. H. Rumble,** B.SC.

OBITUARY

We regret to report the death, on 6 July, of **Mr J. J. Conlan,** editor of the *Beama Journal.* He was 63. He joined B.E.A.M.A. in 1915 as assistant to the then director, Mr D. N. Dunlop, in his capacity as editor of the *Beama Journal,* of which he was appointed editor on Mr Dunlop's death in 1935. He was also secretary of the Beama Publicity Committee from 1945 to 1953, and had since served as a member of that committee. Some of the other numerous Beama activities in which he played a prominent part were the electrical section of the Wembley Exhibition in 1924, and the formation of the World Power Conference in the same year. He was also responsible for the many books and other publications produced by the Association, of which the best known are the study of the life and work of Faraday, and the *Beama Catalogue.* He will be greatly missed by a wide circle of friends in the industry.

Mr A. J. Barry, area manager at Manchester to Siemens Electric Lamps and Supplies Ltd., who died on 8 July, aged 64, had been with Siemens since 1914. Prior to going to Manchester in 1947 he was branch manager at Sheffield for 12 years.

Mr L. F. Forgarty, J.P., M.I.E.E., F.R.S.A., the founder and managing director of the Zenith Electric Co., Ltd., died on 8 July, aged 73. He was also chairman of the Ruislip-Northwood U.D.C., from 1939 to 1942.

Mr L. Pywell, London director of Gent and Co., Ltd., died on 8 July, aged 56. He joined the company at Leicester in 1915, and had been in charge of the company's London office from 1925. He was appointed London director in Jan., 1946.

Mr E. E. Hoadley, C.B.E., M.I.E.E., who was borough electrical engineer and manager at Maidstone for 47 years, died on 7 July, aged 80. Mr Hoadley was still in his twenties when he was appointed "chief" at Maidstone in 1901. After nationalisation of the undertaking he continued there as district manager for a year, retiring at the end of Mar., 1949.

Mr E. E. Hoadley

Born at Rochester, Kent, he was educated at the Mathematical School, Rochester, and Finsbury Technical College. He became a pupil with the Chatham, Rochester and District Electric Lighting Co., going to the Eastbourne Electric Light Co. as junior assistant, and then to Islington and Worcester. After a period as chief electrical engineer at Barking he went back to Worcester as city electrical engineer, but it was mainly for his long and successful association with the Maidstone Corporation undertaking that Mr Hoadley will be warmly remembered by many in the industry. Under his energetic and able guidance the Maidstone undertaking developed to be one of the most successful in the country; incidentally, he was a pioneer in the introduction of Ljungstrom turbines into England, and he also introduced the first Actadis ripple control system here. He was a member of the I.M.E.A. for fifty years, including 20 years on the Council, during the last 13 of which he was hon. secretary, and was president in 1934-35. He was also chairman of E.D.A. in 1942-44.

Mr Harold Bentham, M.I.E.E., who died at Weston-super-Mare on 5 July, aged 79, was formerly chief electrical engineer to the B.E.T. Federation Ltd. and the National Electric Construction Co., Ltd., and a director of the B.E.T. Electricity Supply Co. He was also a member of the Council of the Power Companies' Association and served on the council of the E.R.A., of several B.S.I. Committees and on tariff committees set up by the Electricity Commission. He started in the Electricity Supply Industry in 1899 with the Brighton Corporation undertaking, after gaining industrial experience. He was later engaged on power station erection and in 1902 became managing engineer to the Birkdale District Electric Supply Co., and tramways engineer to Southport Tramways Co. In 1918 he joined the Shropshire, Worcestershire and Staffordshire Electric Power Co., as executive (development) engineer, and subsequently became advisory engineer to the Lewes, Merthyr, Sheerness, and Weston-super-Mare associated companies. From 1940 to 1948 he was also managing director of the Lothians, Boston, Musselburgh, Colne Valley and Northwood companies.

NEW LITERATURE

Electric Traction Engineering

by E. A. Binney.

THE electrification of main line railways is a "live" topic at the moment, and Mr Binney's book is thus most timely. The author who is at present Chief Engineer of Traction Development Department of the English Electric Co. has had a remarkably wide experience with electric traction of all types, and has compressed much of this into the volume. The appeal is mainly to the student who is considering entering the field from the engineering rather than the operating side although a broad outline is given of the probable trends of development of the various forms of traction. Considerable attention is paid to the design of the axle-suspended d.c. traction motor, although the single-phase machine is not omitted. Control systems and project engineering are also briefly covered. Published by the Cleaver-Hume Press Ltd., 224 pp. 4½ in. by 7½ in. Price 15s.

Linear Transient Analysis

by Ernst Weber.

THIS volume covers the classical and operational techniques of analysis of lumped-parameter two-terminal networks, as well as Laplace transform and Fourier integral methods. It is thus comprehensive in its attack. The first chapter deals with a critical examination of the circuit concept and its relation to the electro-magnetic field concept of Maxwell. In the second chapter the author reviews the classical formulation of transients in linear networks, emphasising the discontinuous nature of many source functions and the consequent necessity for careful procedure in the mathematical treatment. To the engineer, analogues provide, within their limits of error, a convenient short cut, and a fundamental review on analogue representations is included. The author then goes to the Heaviside operational method with H. Jeffrey's modification; the Laplace transform and finally to the frequency spectrum concept illustrating the transition from the discrete spectra of periodic functions to continuous spectra of non-periodic functions paralleling the transition from Fourier series to Fourier integrals.

Appendices provide the required mathematical background for the various sections. Published by Chapman and Hall, 348 pp. 5¼ in. by 9 in. Price £3.

Electrical Equipment in Mines

Edited by H. Cotton, M.B.E., D.SC., M.I.E.E.

ELECTRIFICATION of coal mines is being pursued with vigour by the National Coal Board, and this book will prove a valuable addition to the working reference library of all engineers who become involved with it. The plan adopted is to present reasonably comprehensive articles on each aspect of mining electrification, by engineers expert in the particular field concerned. The subjects covered in this way include power supply generally; switchgear and underground cables; air compressors, coal getting machinery, pumps, haulage and conveyors, windings and fans; lighting and signalling; and equipment for open-cast mining. Although there is inevitably much description of general electrical engineering practice, the particular requirements of coal mining are apparent on nearly every page. Particularly useful to engineers only incidentally concerned with underground electrification will be the description in some detail of plant currently used in mines which description is well backed by numerous illustrations. Although the text is mainly descriptive there are many examples of methods of calculation, of characteristic curves, and of tables of representative values. This is a reference book likely to remain an established authority for many years to come. Published by Newnes, 456 pages, 9 in. by 6 in. Price 50s.

Fundamentals of Electrical Engineering in M.K.S. Units

by E. Hughes, D.SC.(ENG.), PH.D., M.I.E.E.

TEXTBOOKS for the third year of O.N.C. and the rough equivalent in subject matter Part I, B.SC.(ENG.), London, are many, and their contents are stereotyped by the syllabuses they serve. One of the peculiarities of the present volume is indicated in the title: being a newly written textbook it uses the M.K.S. system throughout its chapters, and in the many trial problems it presents. These problems are presented in larger numbers than is perhaps usual, and are used effectively as an integral part of the teaching of the book. According to the author, there are 63 in all, while another 424 problems are listed at the ends of chapters, with numerical answers provided. One other noticeable feature is the use of the "per unit" system where possible in place of the "per cent"—another practice in keeping with modern trends.

Of the text as a whole, it should be sufficient to say that it reaches Dr Hughes usual standard of clarity. There is a refreshing absence of stilted phrasing, which makes this volume more readable than is usual in a textbook—surely a great advantage for the flagging student. Finally, it may be noted that it is a sequel to the same publisher's *Principles of Electricity in M.K.S. Units*, by Morley and Hughes. Published by Longmans, Green, 470 pages, 7¼ in. by 5½ in. Price 12s. 6d.

Handbook of British Refrigeration Material, 1955

FROM its subheading "Home and Overseas Buyers' Guide" is clearly indicated that this book is essentially a trade reference volume, and one which is both extensive and informative in the sense of advancing general knowledge in refrigeration. Apart from descriptions of current machinery, materials and equipment, the handbook incorporates useful technical data tables for owners and operators of refrigerating plant. Other pages provide reference to institutions established in the industry and to public cold stores, ice factories and low temperature stores in this country. In its main section, it gives, in conventional style, an alphabetical list of refrigeration firms and a classified list of materials and manufacturers, followed by its extensive illustrated catalogue. It is split into four sections, dealing with machinery, power and plant equipment, insulation and cold rooms and instrumental equipment. Seventh edition, published by "Modern Refrigeration," Refrigeration Hse, Woking, Surrey, 290 pages, 9½ in. by 7½ in. Price 25s.

BOOKS RECEIVED

The Earnings of Industry, 1955 Edition. Up-to-date edition of annual publication discussing prices, profits, taxation and wages, showing their distribution. Published for Aims of Industry Ltd., by Hollis and Carter Ltd., 79 pages, 8½ in. by 5½ in. Price 4s.

The Commissioning of Electrical Plant, by R. C. H. Richardson. One of publishers' series of monographs on electrical engineering, this new edition incorporates both new and revised text to provide engineers with up-to-date general and precise information on the subject. Third edition, published by Chapman and Hall, 440 pages, 8½ in. by 5½ in. Price 50s.

Electromagnetic Principles of the Dynamo, by Prof E. B. Moullin. Primarily an academic work for students, it can also provide foundation for detailed study of advanced problems in dynamo design. Published by Oxford University Press, 367 pages, 9¼ in. by 6 in. Price 50s.

Lignes Electriques I.H.T., by H. Carpentier. In French, detailing technical studies, construction and erection of overhead lines. Published by Editions Eyrolles, 61 Boulevard St Germain, Paris, 5e, 250 pages, 9½ in. by 6½ in. Price 4,800 fr.

Australia's Power Resources, ed. by N. R. Willis. Record of papers presented to the 1954 Winter Forum of the Australian Institute of Political Science. Published by Angus and Robertson, 105 Gt Russell St, W.C.1, 149 pages, 8½ in. by 5½ in. Price 12s. 6d.

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Tell Tale Rust

AFTER a few years of service on a compressor drive, a 100 h.p. slip ring motor developed a decided "knock." Apparently the noise had developed gradually and was a function of the load becoming more intense as full load conditions were approached.

Electrical tests indicated nothing amiss, the load being balanced in each phase of the stator and rotor windings. Rubbing of the cores was suspected and before dismantling readings of air gap were taken which were, however, found to be reasonably even. The following weekend the motor was dismantled and examination verified that the cores had not been in contact. Eventually it was noticed that there was a slight amount of rust at the rotor stampings where they were mounted on the arms of the spider and in fact it was possible, with difficulty, to insert a small feeler between the rotor core and the spider arms—in other words the rotor core was slightly loose on the spider.

Faced with the problem that the motor had to be back in service for the following Monday morning the rotor was taken to a specialist firm of welders and, with appropriate packing to protect the winding, the core was welded along its length to each side of the spider arms. When the motor was re-installed the "knock" had completely vanished and although a spare rotor has been obtained this has not been required, as after two years of almost continuous service since the rotor was welded, the performance of the motor continues to be perfectly satisfactory.—*"Torque."*

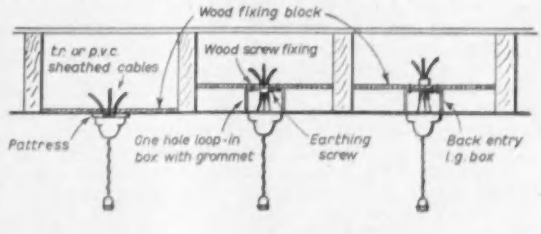
Installing Ceiling Fittings

THE present-day use of the bakelite pattress behind ceiling roses, when an installation is carried out in p.v.c. or t.r. sheathed cable, is certainly an improvement over older methods, but in practice there are still a number of disadvantages to be overcome. A particularly difficult problem arises when, after the installation has been duly inspected and connected, the consumer requires lighting fittings installed. To accomplish this, the electrician removes the pendant and pattress and is faced with the difficulty of connecting the fitting to the cables and still complying with I.E.E. Reg. 404 J. If a hardwood block is fitted there is seldom room for the necessary connectors between the block and the fitting backplate, with the usual result that the ceiling is scooped out and the connectors fitted behind the block. Moreover, if the fitting is metal, no earthing is possible (short of removing floorboards and installing an earth, to which most clients will seldom agree) since it is not very often that one finds an earth already installed at a ceiling point.

As most rooms contain some "earthed" metal, there are very few situations that can really be termed earth free. In most cases, however, the non-earthing of metal fittings may be considered reasonably safe but an instance I once encountered has made me wary of this practice. A room had been decorated for Christmas with the usual decorations, including lengths of tinsel string, about ¼ in. wide, attached to the stem of a metal lighting fitting and hung across to the walls. The flexible cord in the fitting had perished and the phase wire was short-circuited on to the stem, making this and consequently all the tinsel strips, alive. After a child had received a shock from touching the tinsel, I was called in to effect repairs. In this case, fortunately, the shock was not severe but it is not difficult to imagine situations where the result could have been far more serious than it was.

I would suggest that a better arrangement at the ceiling point would be the use of metal outlet boxes, which could be installed quite cheaply by the following method. The metal boxes could be either of the one hole, loop-in type using a rubber grommet at the cable entry or else lug-grip back entry types, with a short piece of conduit and rubber bush. The back of the box is drilled and tapped 2 B.A. for an earthing screw and washer, and provided with two 3/16 in. holes for attaching the fitting. Feeds between boxes can then be run with earth continuity conductor, which is to be made on to the earthing screw.

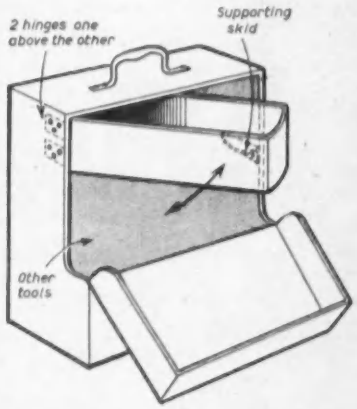
By this method the stripped cores of the cables, together with connectors for the fitting; would be contained inside the box. Further, as most metal fittings have 2 in. centre fixings or can be re-drilled to these centres, a far better method of fixing is obtained and the fitting is earthed.—*W. Satchwill.*



Far left is shown the usual arrangement of pattress and ceiling rose. Centre and right show the use of metal boxes to which a fitting can be securely attached and earthed

Hinged Drawer

AS most electricians make their own tool boxes, the following suggestion may prove of use. It is a design worked out to overcome the drawback of most hand-made tool boxes. These are almost invariably fitted with a sliding drawer, which frequently slides completely out of the box to scatter its contents over a wide area.



Main constructional details of hinged drawer for electricians' tool boxes

The improved method overcomes this drawback by using a drawer hinged at one side, as shown. With drawers of usual depth it will be necessary not only to fit two hinges, but also to support the far side of the drawer on a small rectangular bracket or skid. If the drawer is made the full width of the tool box it will also be necessary to radius the inner corner to enable the box to be swung out.

If preferred, two half-width drawers can be used, although in this case the central skid will have to be supported both from the back and the top of the box. An additional possible refinement is that of a small spring clip fitted to the skid to retain the drawer in its closed position when not required, thus enabling the tool box itself to be tilted forward in safety.—*R. T. Clark.*

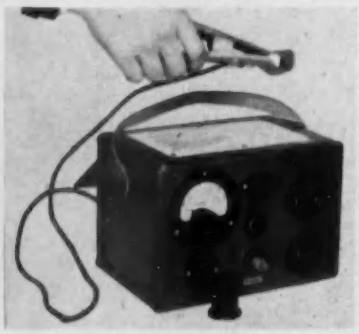
Equipment for Industry

Full Load Earth Tester

PERHAPS the most frequent cause of accidents arising from the use of portable electrical tools is that of faulty earth connection and it is generally acknowledged that maintenance and testing should give special attention to earth continuity. It is, however, particularly important to ensure that continuity not only exists but is capable of carrying the full fault current likely to be experienced, which can only be verified by subjecting the earth continuity path to a heavy current test.

To this end, the BRITISH CENTRAL ELECTRICAL CO., LTD., 6/8, Rosebery Avenue, E.C.1, now offer the "Briticent" full load earth continuity tester, which will not only indicate a wrong connection, but also a high resistance path to earth, and thus that the tool is not safe for use.

The instrument, housed in a robust, polished wood cabinet, comprises essentially a double wound transformer and direct reading ammeter calibrated in ohms. One side of the transformer secondary winding is connected to the earth tube of a 15 A, three-pin, socket-outlet



The "Briticent" full load earth continuity tester for portable tools

on the front panel and the other to a flying lead and heavy duty crocodile clip, through a tapping switch, spring loaded test button and ammeter. To test the tool, its plug is inserted in the socket and the crocodile clip clamped to the earthed metal work of the tool and the circuit closed by the test button. The ohmmeter indicates the resistance of the continuity path, provision being made to short-circuit the secondary through the ammeter to adust zero.

Cutting Chases

TO overcome the arduous work of cutting chases in brickwork and other masonry, VERROLEC LTD., Balfour Hse, Finsbury Pavement, Moorgate, E.C.2, are now marketing the "Saka" slot cutting machine wall mill enabling slots up to 1·3/16 in. to be cut with relative ease, with the use of an electric drill taking up to 5/8 in. drills and running at 400 to 500 r.p.m.

Essentially the cutter comprises a pair of carbide tipped milling wheels housed in a protecting cover to permit channels of up to 1·3/16 in. depth to be cut, although an alternative can be supplied

Here is seen the "Saka" channel cutter in use

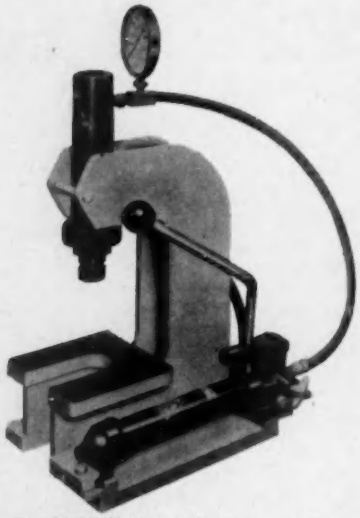
to cut to a maximum depth of 1·21/32 in. Both depth and width of cut are adjustable, the latter down to 5/8 in. Normally the cutter is attached to the drill by using a connecting sleeve between the main shaft of the electric drill and the cutter spindle. A split ring adaptor is then assembled over the nose of the drill and tightened on to it by a clamp on the attachment. Both wheels are driven over reduction gearing, housed in an hermetically sealed box. Guide rollers are fitted to facilitate manipulation and handling.

When cutting vertical slots, little effort is stated to be required once the cut in depth has been made, since the weight of the tool supports its operation. Cutting speeds at 1·3/16 in. depth are claimed to be 3 ft/min. approx. in normal brickwork. It weighs 11 lb.

Versatile Arbor Press

DESIGNED primarily for light engineering work, the "Staffa" 5-ton arbor press recently introduced by CHAMBERLAIN INDUSTRIES LTD., Staffa Works, Leyton, E.10, provides the workshop with a valuable tool where accurate press work is required. It is particularly suitable for specialised needs since its steel section construction facilitates the welding to it of jigs and other adaptors for such purposes whilst its machined surface plate will be of adequate size for most requirements.

Used in conjunction with the company's "Hydroram" pump and ram unit, the press makes available a progressive thrust of up to 5 tons at the ram nose. Retraction of the ram after pressing is automatic, requiring only a half turn of the pressure release valve. Moreover, since the pump and ram unit are self-contained and easily removable, a remote jack unit, with a 3 ft long interconnecting hose, is thus also provided for applications where a standard one-piece jack cannot be used.



The "Staffa" 5 ton arbor press is versatile

Assessing Surface Roughness

DESPITE the availability of complex electronic and mechanical test apparatus, the fingertips are often a better guide to the surface roughness of finished articles where normal surface finishes are being machined. To permit the fingertip to be used objectively, however, requires a surface of known roughness as a standard. Such surfaces are now available from Rubert and Co., Ltd., Chapel St. Levenshulme, Manchester, in a series of surface roughness scales. With these instruments, it is possible to find the quality group into which the surface under test falls, rather than determine accurately the exact value in micro in. of the roughness peaks and troughs.

Scales are available in pocket sets of 10 stainless steel rectangular specimens complying with the specifications laid down in BS 1134:1950 and in large sets of 30, of both rectangular and round types, contained in a polished wood case. The latter set gives a number of scales of the same roughness, but produced by different methods. All specimens are graded in micro inch c.l.a. to British Standard scales. The use of surface scales not only avoids the cost of electronic testers but avoids damage to the surface under test, the finger nail being much softer than the stylus employed in testing equipment. They also permit the specification, in drawings, of surfaces finished to a specific scale, thus avoiding the use of ambiguous terms.

De Luxe Version of Cotswold Heater

A DE LUXE version of the "Cotswold" fan heater which has proved very popular since its introduction last year is announced by GILLOTT ELECTRO APPLIANCES LTD., Cotswold Works, Chalford, Glos.

The new model embodies the following modification — it is fitted with two-speed motor control in addition to the heater/fan cut-out switches, thus providing slow - speed whilst heating or fast-speed for normal fan usage. It is fitted with a 15 W amber pigmy lamp which provides a pleasant glow when the element is on. The colour scheme is now in two shades of grey in place of the familiar warm bronze and maroon. Switches and handle are ivory. List price will be £7. 19s. 6d. plus £2. 18s. 4d. p. tax making a total of £10. 17s. 10d.

The de luxe version of the Cotswold

New Family Battery Charger

A NEW family battery charger having a number of advantages over its predecessor but cheaper in price has been announced by THE GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2. The charger which is suitable for 2 V, 6 V, or 12 V batteries (charging one, two, three or six cells) operates at a maximum charging rate of 2½ amps. as opposed to the nominal current rating of 3 amps. in the earlier model. The front panel carries plugs and sockets for different battery voltages. Input supply is 200/250 V, 40/60 c/s, but chargers for a supply of 100/125 V, 40/60 c/s, can be supplied to order. The lower output current has enabled the size of the double wound transformer and selenium bridge rectifier to be reduced. The same size charger casing is used thus giving relatively greater cooling area. Rotary resistance control has been superseded by a fixed ballast resistance in the circuit which limits the charging current and prevents possible damage to the unit or battery on charge. A simple easy-to-read meter is provided to give the maximum current setting. The charger is finished in hammered green enamel and has a full load consumption of 50 W. Dimensions are 9¼ in. x 5¼ in. x 5 3/16 in. It weighs 7¼ lb and is priced at £6. 4s. 6d.

TRADE PUBLICATIONS

DUST COLLECTION.—Publication 6506 issued by Sturtevant Engineering Co. Ltd., Southern Hse, Cannon St, E.C.4, describes the Uniclone dust collector. No. 5302—the 4X industrial vacuum cleaner and No. 5010 the range of industrial vacuum cleaning equipment available.

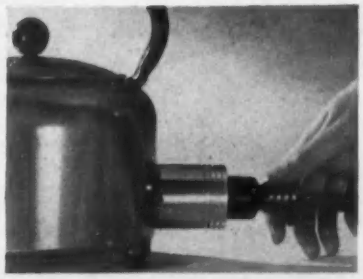
BOILERS.—New Technical Publication No. 198 issued by The Feedwater Specialists Co., St Paul's Sq, Liverpool 3, gives information on the lime/soda and base exchange water treatment processes.

CONSTRUCTION.—Beautifully produced brochure marks the centenary of the founding of Robert Dempster and Sons Ltd., Mount Iron Works, Elland, Yorkshire, coal handling and constructional engineers, and presents a record of the century of progress.

Improved Connectors for Elga Kettles

NOW supplied with the "Conquest" range of kettles by ELGA PRODUCTS LTD., Railway Place, Wimbledon, S.W.19, the new improved connector is moulded to form an excellent finger grip with horizontal ribbing on the surface for ease of handling. Particular care has been taken to provide firm and reliable earth continuity by means of efficient design of earthing clips. Dealers will welcome this new connector which should help obviate torn flexibles.

Elga improved kettle connector



Shaped Wood Shades in New Lighting Fittings

OUR photograph shows one of the new range of lighting fittings marketed by ALLEN PRODUCTS, 6 Wendell Rd, Shepherds Bush, W.12. This particular model is a new application of 1·5 mm resin bonded birch plywood. It is cold formed and holds its shape by the tension on the brass joining brackets. Named the P.I. Pendant, this model is priced £2. 2s. to the trade, full retail price being approximately 50% greater.

For the Electrical Trade

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Mixer Attachment for Power-Drill

THE latest addition to the range of attachments available for the ¼ in. general purpose power hand drill by S. N. BRIDGES AND CO., LTD., Bridges Place, Parsons Green, S.W.6, is the Nu-Mixer which we have illustrated. Priced at £4. 17s. 6d. and including a creamer attachment bit this unit will make even more desirable the acquisition of a Bridges Tool Power Kit. The home handyman gets a valuable tool and the housewife a highly efficient twin blade mixer. The Nu-Mixer is easily attached to the drill chuck and spindle by use of the chuck key and a wing nut clamp.

Incidentally the range of components for the Bridges Tool Kit can be either purchased individually or as kits of parts to afford the drill owner a lathe, bench saw, drilling machines, bench sander drill polisher, bench grinder, hand sanding machine or power hedge trimmer.

The Nu-Mixer is easily attached to a drill

NEWS OF THE WEEK

Coal Dearer by 18 per cent will cost C.E.A. £18m. Extra

THE Coal Board announcement of increases on all grades of coal by an average of 11s. 5d. per ton, has brought warnings from private industry and the gas and electricity authorities of probable repercussions on price levels.

These increases which will operate from next Monday (18 July) will, on average, add 9s. 3d. per ton or an extra £18m to the fuel bill of the Central Electricity Authority. If this is passed on fully to consumers it would mean increases of about 3s. in the pound. The average increase per unit on bulk supplies to the area boards will be about 0·066d.

This step, the largest since the industry was nationalised, is necessary say the National Coal Board to "bring prospective expenditure and income into proper relation." The increases are expected to yield £53m by the end of this year and £118m in a full year, even so they would not reduce the accumulated deficit now over £17m by the end of 1956 for the deficit is expected to rise by £15m by the end of 1955 and not all of this is likely to be made good in 1956.

Four main factors which affected the Board's financial commitments were named by Mr J. Latham, finance member of the Board, as being (i) the effect on the industry of rising wage and price levels in the general economy, (ii) the need to provide for losses expected to arise from the import of 12 million tons of coal and sold to the consumer below cost. These were likely to be around £27m, (iii) the rising interest and depreciation on expenditure in the rehabilitation of the industry, and (iv) increased expenditure on promoting safety and health in the pits.

Changes in Export Licensing

CHANGES in export licensing control are made by a Board of Trade Order which came into force today. Licences are now required for the export to all destinations other than the British Commonwealth, the Irish Republic and U.S.A. of the specified cables and cable making machines, certain generators, turbo-generators, motor generating sets and synchronous condensers, and specified line communications transmission equipment. Licences will be required for the export to all destinations of certain nickel bearing alloy steels. Except for exports to China, Macao, Tibet and North Viet Nam, licences are not now required for certain micro flash apparatus, instrument mechanism jewels and certain turbines.

The Export of Goods (Control) (Amendment) Order 1955 (S.I. No. 984) is obtainable from H.M. Stationery Office.

All-Wales Board Means Higher Charges say Industrialists

THE pros and cons of an all-Wales electricity board were among views put forward to the Herbert Committee, which is inquiring into efficiency of the electricity supply industry, last week. Objecting to any change from the present two-board system, Mr H. V. Carter, director of the Industrial Association of Wales and Monmouthshire, said industrialists considered an all-Wales board would mean higher tariffs, especially in North Wales, if its connection with Liverpool industry was severed. But Prof H. Lewis, former professor of Welsh at Swansea University College, contended that economic considerations should not be allowed to set aside very important sociological and ethical values concerned in an all-Wales board. Asked if such a board meant increased charges in South Wales, and whether they would outweigh the desirability of a combined distribution board, Prof Lewis said if economic considerations were too much for a joint board, then the Council for Wales would bow to circumstances. One speaker referred to the alleged slow progress of rural electrification in Wales, while another suggested that the cost of unremunerative rural electrification should be borne by the industry nationally.

EXTENSION OF FIXED-PRICE COPPER SOUGHT

IN addition to welcoming the initiative of the Rhodesian Selection Trust in offering copper at a fixed price below the London Metal Exchange figure, the British Non-Ferrous Metals Federation has now urged the other group of Rhodesian producers to adopt a similar practice. At last week's annual meeting of the Federation, Mr W. F. Brazener, the new president, said they had no doubt that the long-term interests of copper lay in a determined attempt to arrive at a stable and lower price designed to protect the future of the industry when more difficult market conditions emerge.

S. SCOTLAND BOARD NEEDS 600 MW IN 5 YEARS

SUMS approaching £20m a year will probably be spent on capital equipment by the South of Scotland Electricity Board for many years to come, Mr J. S. Pickles, chairman of the Board, told the newly-constituted area Consultative Council at its inaugural meeting last week. The Board were budgeting for doubling the increase in consumption over 10 years, and at least 600 MW of additional generating plant must be commissioned in the next five years. There were now 1,125,000 consumers in the Board's area, and 10,700 farms were being supplied—about 60%. "We accept it as a public duty to get the remaining farms connected, and we shall take a broad brush to it, because it cannot be made to pay on its own," he said.

Lord Strathclyde, Minister of State for Scotland, said the Scottish Boards had freedom which enabled each to make the most of its resources and, at the same time, to co-operate with each other and with the C.E.A. in matters common to all. With such a flexible machine there should be none of that frustration which so often arises in large-scale organisations, he added.

Telcon acquire Lamination and Stampings Firm

THE Scottish firm Magnetic and Electrical Alloys Ltd., of Burnbank, Hamilton, has been acquired in full by the Telegraph Construction and Maintenance Co., Ltd., to achieve closer integration of production combined with greater efficiency and economy in Telcon's metals division.

The two companies have been closely associated for years, Telcon supplying nickel-iron alloy strip from which M. and E.A. produced heat-treated laminations, cores and stampings. M. and E.A. also produce silicon iron laminations including transformer and motor laminations and core assemblies.

The Scottish company will continue business as usual. The chairman, Mr J. Ancil Holden, continues in that office, and Mr A. A. Asplin continues as works director at Hamilton. Mr W. F. Randall and Mr B. H. Musgrave, both Telcon directors, have been appointed to the Board, Mr Randall as vice-chairman and managing director. Both Mr Holden and Mr Asplin were formerly with the Telcon organisation leaving in 1929 to found M. and E.A.

More Households with Electricity, Fewer with Gas

ALTHOUGH mainly concerned with the reading habits of our population the ninth Hulton Readership Survey again provides some notable figures concerning the use of gas and electricity. A total of 11,592 households were interviewed prior to the newspaper strike, though a quota sample covering 13,000 persons was planned. Once again the number of persons with electricity has jumped considerably. No fewer than 14,680,000 householders have electricity, an increase of 280,000 over last year, an appreciable increase although not reaching the rise of 400,000 between 1953 and 1954. This latest increase in electricity users is the more commendable when it is compared with the number using gas which fell by 60,000 to a total 12,140,000. This last fact is borne out by the following table:

AVAILABILITY OF ELECTRICITY AND GAS

Classes:	AB	C	DE	All
	%	%	%	%
With gas and electricity	74	74	71	72
With electricity only	24	24	20	22
With gas only ...	—	1	7	5
With neither ...	1	1	2	1
Total with electricity	98	98	91	94
Total with gas ...	74	75	78	77

Class AB: well-to-do and middle; Class C: lower middle; Class DE: working and poor.

Comparison between the above and last year's figures show that in all except the working and poor classes, which remain the same, fewer households had gas and in all except the well-to-do and middle classes (same) more had electricity. Households with gas only have decreased appreciably while, except for class D-E, more households had electricity only.

In this, the third year that the Survey has dealt with television viewers and their reading habits, more information has been gleaned from the interviewed. A total of 12,040,000 are now estimated to have television sets compared with 9,190,000 last year. The following table shows the make-up of our TV audience:

POSSESSION OF TV SETS IN THE HOME

	Estimated No. of adults. Thousands		Estimated No. of adults. Thousands
All Adults	12,040	Age	
Men	6,100	16–24	1,820
Women	5,940	25–34	2,480
Class AB	1,830	35–44	2,890
Class C	2,620	45–64	3,940
Class DE	7,590	65–	910

The increases are shown in all classes and all age-groups of the population. The biggest rise again occurs in class C where there were 490,000 more households with sets this year than last. 280,000 more people in class DE had television this year, but it is notable that only 90,000 more in class AB had sets. Biggest increase in the age group was in the 45-64 bracket where this year's figure of 3,940,000 was 920,000 more than in 1954.

IMPORTANT IRAQ CONTRACT

A CONTRACT, valued at £200,000, for the installation of the complete electrical services in the new Houses of Parliament now under construction at Bagdad, Iraq, has been placed with James Kilpatrick and Sons Ltd., who are already engaged on similar work for the new royal palace.

Meter Advertisement

FERRANTI LTD. wish to draw attention to an error in the text of "No. 5 in a series of announcements" featuring their FMP prepayment meter which appears on p. 29 of this issue. The formula representing the coins in the box is incorrect and should read "Price per unit (units used + units unused)."

The First Half-Century

At the opening of the Electro-Technical Laboratories of the University of Liverpool, Sir Joseph Wilson Swan said, or is reported to have said, that electrical engineering is still in its infancy. He ought to know for he may almost be said to be the father of the infant, but some parents never realise that their children have grown up. The remark has so often been put down to men who never said it that I am rather suspicious of the report, but at any rate, Sir Joseph was in a hopeful mood, predicting new electrical industries and an undreamt of expansion in those we have. It is very cheering to find this optimism. It contrasts strongly with a despondent verdict I heard lately from another electrical inventor who seemed to regard the industry as in its dotage. "What is wrong with electrical manufacture," he said, "is that we have reached 98 per cent efficiency too soon." It had become rather a trade than a profession, and an ill paying trade at that.—*From our issue of 13 July, 1905.*

New E.L.M.A. Terms Now in Effect

NEW discount terms on purchases of lamps produced by member companies are announced by the Electric Lamp Manufacturers' Association with effect from 1 July. At the same time reductions in purchase tax on filament lamps in groups 1, 2 and 8, up to and including 250 W and fluorescent-tubular lamps (group 9) up to and including 80 W are subject to purchase tax. Tax now chargeable is quoted as 17½% of list price for groups 1, 8 and 9 lamps, 16½% of list prices for group 2 Kye lamps.

Stella Quit E.L.M.A.

SECOND Company to leave E.L.M.A., the Stella Lamp Company, has followed the lead of Philips Electrical, and severed their connection as from 1 July. Both companies are linked with the Dutch Philips organisation. Philips Electrical resigned from membership of the Electric Lamp Manufacturers Association because of policy disagreements which could not be reconciled.

BICC Travelling Scholarship is Tribute to First Hon. President

VALUED up to £1,000 in addition to normal emoluments the Sir Alexander Roger travelling scholarship will be awarded annually to an employee in the British Insulated Callender's Cables group to enable the selected young man or woman to travel overseas for one year's study training and education.

The scholarship has been instituted as a tribute to Sir Alexander Roger, K.C.I.E., for many years chairman of the company and now its first Honorary President. The decision to make this award a travelling scholarship has been taken in view of Sir Alexander's frequent expressed faith in the younger generation and his world-wide outlook on industry and commerce.

G.E.C.'s new lighting showrooms at Magnet House, Kingsway, now afford inspection of every style of lighting fitting from early Elizabethan to contemporary against an appropriate background decor. An attractive open plan permits the arrangement of fittings with adequate spacing for seeing their merits to advantage. Through the wide arch linking the traditional and domestic sections are seen some of the alcoves arranged to show fittings in suitable domestic settings

Part of the recently completed section of the S. of Scotland Board's new George St, Edinburgh, showrooms, opened a short time ago

VIENNA WILL BE SCENE OF 5th WORLD POWER CONFERENCE

ARRANGEMENTS for future meetings of the World Power Conference were discussed at a recent meeting of the National Executive Council. The time table and draft technical programme for the 5th World Power Conference to be held in Vienna from 17-23 June, 1956, was agreed, together with the draft technical programme for the sectional meeting in Yugoslavia in 1957. An invitation to hold a sectional meeting in Canada in 1958 was re-affirmed and the venue is to be Montreal in Sept. of that year. There will be a sectional meeting in Switzerland in 1960. It was unanimously decided by the 45 delegates present at the Council Meeting (representing 28 member-countries) that the 6th World Power Conference shall be held in Australia in 1962. Other business discussed at the meeting was the admission of Mexico and the Saar as members, and the admission, subject to the completion of formalities, of Venezuela. There are now 46 member countries of the World Power Conference.

Another recent meeting connected with the World Power Conference was the A.G.M. of the British National Committee. At this, Sir John Hacking was re-elected vice-chairman, Sir Vincent de Ferranti is chairman. Invitations were made to the National Industrial Fuel Efficiency Service and to the Institution of Heating and Ventilating Engineers to appoint representatives to serve on the Committee, and these have been accepted as has an invitation to the U.K. Atomic Energy Committee to be represented.

Details have been announced of 26 papers to be presented by British authors at the 5th World Power Conference. These include six on thermal power stations and four on nuclear energy.

TV Film Production Course

FILM production for television is the theme of a part time course of study due to begin in early autumn under the auspices of the British Kinematograph Society, an appropriate time in view of the inauguration of commercial television from the ITA network.

Special lectures will provide guidance in basic principles of TV and cinematography; lighting sound and processing cartoons and in the artistic and technical considerations in film and TV production.

The course is designed both as an introduction to basic principles for newcomers in the field of TV and as a refresher course for experienced technicians. Detailed syllabus is now in preparation and will be available from the Secretary of the B.K.S. at 164 Shaftesbury Ave, W.C.2.

New Showroom Opened in Edinburgh

FIRST instalment of a new service centre at 130 George St, Edinburgh, has been opened by the S. of Scotland Electricity Board. Premises in one of the main shopping centres of the city is being reconstructed to the design of Messrs Gordon and Day. General decor has been treated on a semi-exhibition basis, allowing for flexibility in display. Special attention has also been paid to lighting to emphasis certain displays. Another notable feature of the new showrooms is that the floor is finished with "Alamac" tiles and heated by "Panelec" floor warming equipment. A demonstration platform has been included, and for the time being will be used for continuous demonstrations. Eventually, when the whole service centre is completed audiences will be accommodated. The platform is remarkable for a specially designed stand to take electric cookers. It includes a meter calibrated in pence, with, of course, suitably placed floor plugs, for connections.

Forthcoming C.E.A. Issue?

THE announcement on Tuesday of the issue by the Gas Council of a further £100 millions of 4% stock, 1969-72, at £98, seems to indicate that there will be a further large funding loan by the Central Electricity Authority in the near future. The latter's last loan, issued in Aug. 1954, was of £100 millions at 3½%, 1976-79, which was offered at 100½%. The Treasury's guarantee in respect of the Authority's temporary borrowings is now for £180 millions up to 30 Sept. next. For some weeks now there has been talk in the City of a likely new issue by the C.E.A.

Do Industrialists Subsidise Domestic Tariffs

THE allegation that electricity charges to industrial consumers were unfair, compared with domestic tariffs was raised at last week's meeting of the Eastern Electricity Consultative Council. Alderman W. J. Bennett, presiding, said there was still a feeling among industrialist and large commercial consumers that their tariffs subsidised the domestic consumer. Figures had been quoted showing that in 1938 industry paid an average of 0·66d. per unit, and the domestic user 1·54d. Now the latter still paid an average of 1·54d. per unit notwithstanding the increases in tariffs, while the industrialists' price was over 1d. per unit. He thought it would be a useful exercise for the Council's Tariffs Committee to see whether there was any justification for the industrialists' claim, and it was agreed to ask the Committee to investigate.

Nuclear Energy Exhibition

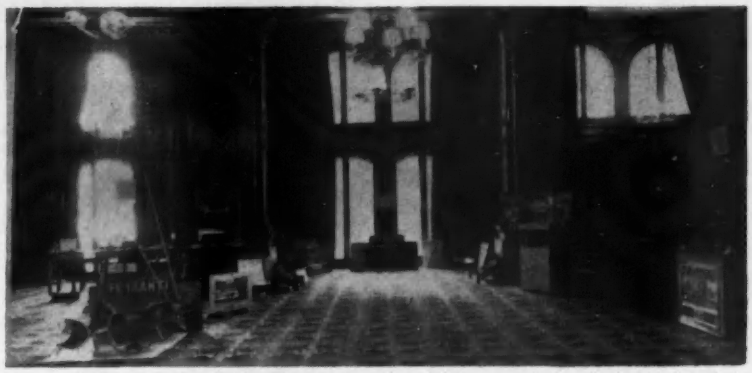
BRITISH programme of nuclear power—the proposals to build 12 nuclear power stations in the next ten years—is the subject of a small exhibition being presented at Charing Cross (Embankment) Underground Station from 8 to 26 July. The exhibition, which includes an animated model of a nuclear reactor power station, is being presented on behalf of the C.E.A.

Giant ATE Communication Exhibition for New Delhi Fair

ONE of the largest exhibits of communication equipment to be sent overseas by a British Company is due to be shipped next month en route for the Indian Industries Exhibition which opens in New Delhi at the end of October. Examples of the entire field of products of the Automatic Telephone and Electric Co. and its Associates which make up the exhibit, range from a demonstration model of a large modern automatic telephone exchange to a new portable low frequency "Guided Radio," designed primarily for below ground communication in collieries. Wherever possible working models have been produced to demonstrate in the simplest form the intricate machinery which goes into a modern communication network.

Manchester Traders See Ferranti Products

A MOST successful exhibition was staged at the Midland Hotel in Manchester recently by Ferranti Ltd., of Moston, with the object of keeping the trade informed about the company's latest products. Prominent in the exhibition were fires, clocks and the heat-pump installations. Special interest was shown in the last named—the Ferranti Fridge-Heater. As previously described this applies the principle of the heat pump, and chills, cleans and dries larder air, gives a limited constant supply of hot water, and costs substantially less than other water heating systems. There were also displays of competitive lines in 2 kW fires and an attractive range of electric clocks.



Fires, clocks and the Fridge-Heater (on the right) attractively displayed by their makers, Ferranti Ltd., in Manchester's Midland Hotel

MUNICIPALITIES TO BOYCOTT CONTRACTING INSPECTION COUNCIL

THE Association of Municipal Corporations, which represents 425 borough councils throughout the country, has been recommended by its General Purposes Committee not to participate in the setting up of the proposed National Inspection Council for Electrical Installation Contracting (to which we referred on 26 May).

In their report to the Association, the Committee say they have some doubts as to the independent character of the proposed Inspection Council, and having regard to its composition, they do not recommend the Association to participate in its setting up. The recommendation follows a letter from Mr W. G. Thompson, officiating secretary to the National Inspection Board-designate, outlining plans for the formation of the Council, in which was included a list of bodies contemplated for initial representation on the Council. In preparing that list, the organising committee took the view that all the bodies named would obtain benefit from or would have some contribution to make to the work of the Council, whose primary object is the protection of consumers against faulty or unsafe electrical installations.

Physical Society's Show

DATES of the Physical Society Exhibition of scientific instruments and apparatus to be held next year were announced last week. The 1956 display will be between 14 and 17 May, and is to be held in both the Old and New Halls of the Royal Horticultural Society, Westminster.

PARENT'S DAY

SATURDAY, 2 July, was the date of two notable Parents' Days. Over 250 parents and friends of British Thomson-Houston apprentices were at the company's Willesden works. The visitors were conducted round the factory by apprentice guides, and afterwards attended the prizegiving.

At the Trafford Park works of Metropolitan-Vickers Electrical Co., Ltd., about 300 parents took advantage of the opportunity to see where their sons worked.

Poster Competition for 5th Electrical Exhibition

THE three best entries submitted will win cash prizes in a poster design competition to be run by the organising committee in connection with the fifth A.S.E.E. Electrical Engineers Exhibition, to be held at Earls Court. Designs from students and amateurs are particularly welcomed. Details of the competition can be obtained from the General Manager of the Exhibition at 23 Bloomsbury Sq, W.C.1.

Commonwealth Conference on Welding in 1957

A COMMONWEALTH Welding Conference is being arranged by the Institute of Welding and will take place in London in the summer of 1957. Its object will be to promote an exchange of information on existing technicalities of welding processes and their main applications throughout the Commonwealth, and to consider means of improving the exchange of technical information. It is intended that the conference should be open to all who are interested in welding. Invitations to appoint official delegates are to be addressed to the welding societies and Government Depts. of all Dominion and Commonwealth territories. An organising committee under the chairmanship of Mr A. Robert Jenkins, has been set up.

NEWS IN BRIEF

Last single-deck trolleybus to run in England has been handed over to the Transport Commission by Ipswich Transport Authorities for inclusion among the Commission's historical relics.

First of 94 Metropolitan-Vickers diesel-electric locomotives for the Irish State Railways was shipped from Manchester at the beginning of this month.

The British Thomson-Houston Co. Ltd., recently entertained Mr F. J. Erroll, Parliamentary Secretary to the Ministry of Supply and Mr B. Kay, Midland Regional Controller, to lunch, and conducted them on a tour of their Rugby works.

London and Home Counties Regional Advisory Council for Higher Technological Education has just issued a new pamphlet on Engineering Education in the Region.

A contract for building work at Blaen Plwy, (Cardiganshire) TV and VHF sound broadcasting station has been placed by the B.B.C. with E. T. Davies and Son. The station will probably be in service by the end of 1956.

A Building Exhibition is being held this week at Doncaster Technical College, St. George Gate. It closes on Saturday (16 July).

A number of visiting athletic clubs took part in the 21st annual Johnson and Phillips Sports Meeting which took place at Kidbrooke recently. Winners of the inter-club competition were Cambridge Harriers with Essex Beagles second.

First of new Case Studies, published by the British Productivity Council (2s. 6d.) is available. The second example of Work Study in Practice features electrical equipment.

First section of the permanent television link between London and the Continent will be completed in September. The section consists of a two-way coaxial cable circuit between London and St Margaret's Bay.

An extensive Standard S.H.F. radio network has been ordered by Japan. The contract was placed with Standard Telephones and Cables Ltd. through their associates, the Nippon Electric Co., Ltd.

New electronic laboratories at the Burnbank School of Engineering, Hamilton, were formally opened recently by Sir Murray Stephens, Lord Lieutenant of Lanarkshire.

Experience of a colleague instanced by the Scottish area manager of the Jackson Electric Stove Co. indicates savings of 90, 126 and 100 units per quarter in power consumption since he replaced by a modern 293 cooker his old cooker with neither thermostat nor simmerstat control.

QUESTIONS IN PARLIAMENT

Hire Purchase and Washing Machines

IN answer to a question in which Mr H. Hynd referred to a firm of electric washer manufacturers in Accrington having to suspend 90 workers owing to slackness of trade following hire-purchase restrictions, it was stated that the President of the Board of Trade was ready to consider representations from anyone about the effect of hire-purchase regulations on sales. He suggested, however, that in the instance stated the rail strike may have aggravated the effects.

Import Machinery

REPLYING to Air Commodore Harvey, the Minister of State, Board of Trade, said steps could not be taken to reduce the present minimum of £2,000 in respect of duty-free imports of machinery to £500. It was alleged by the questioner that the present minimum rate hits small businesses heavily, but Mr Low, said that the matter had been closely considered by the Wilson Smith Committee.

Monopolies Commission

LAST week a number of questions were asked about the Government's action on the Monopolies Commission report on restrictive practices. Replying for the Government the Parliamentary Secretary to the Board of Trade, Mr D. Kaberry, said that it was the Government's intention to arrange for a discussion of the report before Parliament went into recess for the summer holiday.

Metal Industries Responsibility

AN assurance that a group of some 20 leading industrialists representing a cross-section of the industries, as well as the Presidents of Shipbuilding and Engineering unions and A.E.U., attended talks before the transfer of the Ministry of Supply's responsibility for the engineering and metal industries to the Board of Trade, was given by Mr. F. J. Erroll. He was replying to questions by Mr G. R. Strauss. He went on to say it was as a result of the views which they expressed that the decision was taken. Mr Erroll confirmed that there were divided views but the majority were in favour of the transfer. Later, he said the M.o.S. would continue to be responsible for aluminium, magnesium and titanium in all stages beyond that of primary metal which it has at present.

Oil Firing Power Stations

A STATEMENT on the C.E.A.'s recent oil contract with Esso Petroleum, was made by Mr G. Lloyd in reply to questions by Mr G. Nabarro. The Minister said other negotiations were still in progress. Deliveries of oil, he said, would begin towards the end of this year, and it was hoped to save 500,000 tons of coal in 1956 and up to 4m. tons in 1957. By 1960 the use of 5m. tons of oil in about 16 power stations should save 8m. tons of coal. Mr Lloyd said he was satisfied the additional supplies were available.

A further question on tendering for the contract was asked by Mr Nabarro. Did the C.E.A. give the contract to the lowest tender notwithstanding the fact that it was an American concern? he asked. Mr Lloyd said there certainly was evidence of strong competition, and the C.E.A. did what they thought best for themselves.

Fuel Efficiency

STILL on the subject of oil, Mr G. Nabarro asked the Minister of Fuel and Power if he would give emergency advice to industry, etc., in regard to increased efficiency in coal burning, substitution of oil fuel for coal and summer stocking. The Minister said he welcomed the opportunity of urging increased fuel efficiency, and the advantages of replacing coal with oil. He said he hoped to make a fuller statement on those matters soon.

Later the Minister said the National Industrial Fuel Efficiency Service were considering technical arrangements for the switch from coal to oil by industrialists all the time. Fundamentally, however, it was a matter for each consumer to decide in the light of his own particular requirements.

Nuclear Energy

REFERRING to proposals for the National Atomic Energy Agency, the Prime Minister last week agreed that in order that export trade in the nuclear field might not be prejudiced, he would make it clear that this country like the United States of America had the means and the will to give help to other countries. He said that a number of agreements had already been made between the Atomic Energy Authority and corresponding bodies in other countries. These should in due course lead to export trade in nuclear equipment.

Wireless Reception

ANSWERING questions last week on wireless reception in various parts of the country, the Postmaster-General, Dr Hill, said the B.B.C. had now completed the intensive tests necessary to select a site for a television station in Carlisle. It was hoped to open the station at the end of 1956, and afterwards a v.h.f. sound broadcasting station would be established on the same site. Dr Hill also referred to interference with B.B.C. broadcasts in Wales, caused by a station in the Soviet zone of Germany. He said that special technical measures were taken to reduce the effect of this interference, and in addition four low power transmitters were set up, and the power of the Wrexham transmitter was increased. As part of their plans, the B.B.C. were proceeding with two v.h.f. stations to be opened in Wales at the end of this year, and two more later.

Electronics Industry

ANSWERING a question by Mr. G. R. Strauss on Thursday last, the Prime Minister stated that the electronics industry is to remain under the responsibility of the Minister of Supply, and not pass to the President of the Board of Trade.

North Wales Hydro-Electric Bill

THE North Wales Hydro-Electric Bill, which provides for the Ffestiniog and Rheidol schemes, was given a second reading in the House of Commons last week. Opposition to the Bill was led by Mr Gerald Nabarro, who argued that the scheme was uneconomic in capital cost. He suggested that it would be possible by raising the load factor of existing steam power stations to eliminate the need for what he called "extravagant water stations." He estimated that under the hydro-electric schemes it took £290 of capital to save one ton of coal. He suggested that for one-third of the capital cost involved in the North Wales scheme, the C.E.A. could install oil-driven auxiliary generators in existing power stations to meet peak load needs. Other members opposed the Bill on amenity grounds, but a Welsh member suggested that local inhabitants were whole heartedly behind the scheme.

Replying to the debate the Parliamentary Secretary, Minister of Fuel and Power, Mr L. W. Joynson-Hicks, said that the schemes are a useful contribution towards the production of electricity, in an economic and efficient way, as well as being a coal saver. Reviewing the question of electricity generation in Wales, he said that last year, 1954-55, the maximum demand at any time was 730 MW and the maximum generating capacity 704 MW. It is estimated that by 1960-61 the demand will be 1,100 MW. He put the cost of the 300 MW pumped-storage Ffestiniog scheme at £14¼m compared with £25¼m for a 300 MW coal-burning station. This gives a cost of £49 per kW employed, and electricity will be produced at a figure of 0·6d. per unit. The Rheidol scheme, which uses a head of 950 ft will cost £5¼m. With regard to use of oil-powered plant to produce peak electricity, he gave the cost of generation at the Aberystwyth station as 1·2d. per unit. Noting the fears of members about the effect of transmission lines on amenities considerations, the Parliamentary Secretary offered to invite the C.E.A. to meet M.P.'s who were concerned about this question.

Coal Prices

A series of questions on the increase in price of coal was put to the Minister of Fuel and Power on Monday. Resisting suggestions that British coal should be sold at "world prices," Mr Geoffrey Lloyd said that there was no world price in the classical sense, because American coal was cheaper than British and European coal

more expensive. To bring the price of British coal up to average landed cost of exports would increase prices by £2 per ton. Mr Lloyd emphasised that responsibility for supplying coal in this country was laid by statute on the National Coal Board, and the Board therefore had sole responsibility both for production and importation. However, he was in constant touch with the National Coal Board.

Domestic Grates

ON Monday, Mr A. M. F. Palmer asked the Minister of Fuel and Power if he were aware that recent work by the fuel research station of D.S.I.R. showed that improved solid fuel domestic grates as recommended by the Ministry did not have a thermal efficiency substantially different from the common pre-war style grate. He asked if he would revise his recommendation. Mr Geoffrey Lloyd, however, said that thermal efficiency was only one of the considerations to be taken into account, and the ability to control rate of burning and to use coke also counted. He claimed that the modern fires had undoubtedly meant a saving in coal.

Coal Demand

ANSWERING a question last Friday, Mr Geoffrey Lloyd, Minister of Fuel and Power, said that estimates of probable demand for coal supplies available, and the need for imports spread over the next 10 years, would be too speculative to be of value.

Nuclear Power Stations

REPLYING to Mr Palmer, Mr Geoffrey Lloyd said that at the end of the next five-year period, the nuclear reactors of the Atomic Energy Authority should have an installed capacity between 200 and 270 MW, and those of the C.E.A. a capacity between 200 and 400 MW. It was not yet possible to say what amounts of electrical energy would be supplied.

Sayings OF THE WEEK

"The best designer is, in fact, the artist-engineer, because only the artist-engineer can readily understand the enormous possibilities which are constantly opening up with new materials and new techniques." . . . . the DUKE OF EDINBURGH, at the Royal College of Music, last Friday.

"The present position is that the North of Scotland Hydro-Electric Board hardly knows which way to look in their efforts to get more hydro schemes built fast enough to meet the growth of demand." . . . MR T. LAWRIE, general manager of the Board, speaking at Applecross.

"I am sorry to see on the market so many electric fires in the form of mock Georgian grates complete with bogus coal or logs. These monstrosities are in demand from people who like a glow in the hearth. I am all for the glow, but it should be possible to create one without resorting to fakes that look neither old nor natural! . . . JILL CRAIGIE in the *Evening Standard*.

ELECTRIC SUPPLY NEWS

Cheltenham

Feeling that the advances made in the field of nuclear energy has changed matters, the Gloucester branch of the Council for the Preservation of Rural England is to make efforts to have reopened the question of the erection of 275 kV transmission lines over the Cotswold. But members of the branch have been told that in the view of the Minister of Fuel and Power, future developments would be most unlikely to make the grid redundant.

Eire

The second reading of the Electricity (Supply) (Amendment) Bill, 1955, in the Dail last week provided the opportunity for ventilating views on the rural electrification work of the Electricity Supply Board. The principal purposes of the Bill are to authorise an increase from £16m to £25m in the statutory limit of expenditure by the Board on rural electrification, and to provide for the making of advances from the Central Fund in addition to extending the Board's borrowing powers. The subsidy for rural electrification would be terminated but the Board would be able to obtain finance for such work from sources other than the Central Fund. The Minister for Industry and Commerce, Mr Norton, told the House that the development rate was now double that of two years ago. In the year ended 31 Mar., 1953, 49 rural areas were completed; 60 in 1953/54, and 75 in 1954/55. The estimate for the present year was 100 areas. Since 1948-49 the Board had made a surplus in each year except one, and had built up reserves of nearly £2m. He said electricity development in Eire had reached the stage at which electricity consumers and taxpayers were largely the same persons. There would, therefore, be no point in arranging, on the one hand, a slight reduction in charges to consumers, and on the other hand imposing taxes on them to provide for a continuation of subsidy. In future the Board would bear the full costs of rural electrification from its surpluses, but he asserted that this would not reduce the rate of progress. Mr Lemass disagreed with the latter view, while Mr O. Derrig thought that if the undertaking was so flourishing some tariff reductions might have been expected by the consumer after meeting capital charges. Mr MacEntee also considered it unjust that the whole burden of providing electricity in rural areas should now be transferred to the shoulders of the ordinary consumer.

Glasgow

The South of Scotland Electricity Board have approved a scheme for the reinforcement of supply to Newton Mearns, including the construction of two new substations, one in Beech Ave near Shaw Rd, and the other in Firwood Rd at Oakwood Drive. The work will cost over £16,000.

Lake District

At its annual meeting last week of the Lake District Planning Board, Mr K. Dobell, chairman of the development control committee warmly welcomed the decision of the North Western Electricity Board to place underground cables involved in electrifying Borrowdale. When a member put forward the view that this was a tactical victory for the Electricity Board, Mr Dobell expressed the opinion that superior tactics mattered much less than winning battles, and this was surely a notable victory for the cause of landscape preservation.

Little Barford

The C.E.A. has received the consent of the Minister of Fuel and Power to the extension of the Little Barford power station, near St Neots, by the establishment of a new station to be known as Little Barford "B." The present station has an installed capacity of 120 MW. The extension is to comprise two more 60 MW turbo-generators and two 550 klb/hr boilers.

Wester Ross

The power supply to Applecross, Wester Ross, was officially switched on by Sir Hugh Mackenzie, deputy chairman of the North of Scotland Hydro-Electric Board last Saturday. Power is provided from the Board's Nostie Bridge generating station. Out of 120 houses and other premises in the district, 113 have made application for a supply of electricity. Contractors for the scheme were Standard Telephones and Cables Ltd. At the switching-on ceremony, Mr T. Lawrie, general manager of the Board said Skye and Wester Ross were among the many places where the increasing demand threatened to outstrip the capacity of the present hydro stations, and for that reason the Board had decided to build a new 33 kV line from Grudie Bridge to Kyle and Gairloch.

LIGHTING SCHEMES

Eton. The U.D.C. has agreed to install mercury vapour lighting in Slough Rd, in the College area and along High St.

Brighouse. T.C. propose to install improved lighting on the Leeds-Whitehall Rd, at estimated cost of £4,155.

Heston and Isleworth. The council is seeking consent to borrow £4,400 for improved lighting in the Bath Rd.

Middlesbrough. The Watch and Licensing Committee has approved a scheme for 62 140 W sodium vapour lamps in Acklam Rd, to cost £6,300, and for similar lighting for the east-west cross town route at a cost of £12,200.

Woolwich. Improved lighting in 29 roads will cost the council £32,000.

COMPANY ACTIVITIES

THE "Telcon" cable group, which, with Siemens Bros., is manufacturing the first Atlantic telephone cable, is now linking up with two outstanding American and Canadian groups, Canada Wire and Cable Co., Ltd., and General Cable Corporation of New York. Jointly they have formed Telecables and Wires Ltd., which will manufacture in Canada a complete range of telephone wires and cables. Management of the new group will be undertaken by the Canadian company. Mr. John Norman Dean, the comparatively new chairman of "Telcon" (Telegraph Construction and Maintenance Co.) is to be congratulated in the part he has played in bringing together this triple telecommunications engineering experience.

I understand that "Telcon's" special contribution will be the development of new types of telephone cables having thermoplastic insulation.

In addition, "Telcon" is acquiring Magnetic and Electrical Alloys Ltd., of Burnside, Hamilton, Scotland, with which it has worked closely for many years. "Telcon" supplies nickel-iron alloy strip (Mumetal, Radiometal and Rhometal), from which M. and E.A. at their factory at Hamilton produce heat-treated laminations, cores, and stampings for the electrical industry. M. and E.A. also produce silicon iron laminations including transformer and motor laminations and core assemblies. The acquisition will make for closer integration of production in "Telcon" metals division. Mr Dean has taken the occasion to give the terms of a new issue of capital to shareholders with the object of financing the telephone cable contract and the acquisition. It will take the form of 977,046 Ordinary shares at a price of 32s. 6d. They will be offered to Ordinary shareholders in the proportion of one new for each two existing shares held. That leaves 68,862 unissued shares, which are being reserved for offer at a later date to the employees of the company under a scheme which is in course of preparation.

Give a hand to Motor and Electronics Corpn. Ltd. (formerly Rothermel Corpn. Ltd.) for a novel method of raising share capital. I understand that Preference shareholders will shortly be invited to put up new money by subscribing for a composite unit consisting of one new Preference share (with dividend raised from 4½% to 5%), and one 1s. Ordinary share at 21s. for the combined unit.

The Preference shares should be valued at 18s., which leaves only 3s. to pay for the new Ordinary share as compared with the market price of the existing shares at around 4s. 6d. In addition the board is making another share bonus, this time 25% as compared with last year's 33⅓%. That of course goes to Ordinary shareholders. In view of expansion maintenance of the 20% Ordinary dividend is extremely probable and on that basis the prospective Ordinary yield 6½%.—*From our City Correspondent.*

Aberdare Electric Co., Ltd.

This Irish concern, which already manufactures cable, transformers, night storage heaters and steel wire, has decided that it should be interested in the whole electrical field as so many of its directors have been identified with the design and production of electrical equipment. The chairman, Mr C. O. Stanley, states that the directors have come to the conclusion that wherever it is economic to enter an electrical manufacturing business they will do so. Accordingly, a survey of likely branches of manufacture has been started.

Aron Electricity Meter Ltd.

The reduced trading profit for the past year was anticipated, but Mr E. D. A. Herbert, the chairman, considers the results more satisfactory than he expected. This was due to prices remaining stable in the home market, with a general increase in the demand for the company's products. There was also an improvement in export turnover despite keen competition, but such business is less remunerative than it should be, he adds. Production operations have been overhauled, and although turnover in meters was reduced, there was an increase in demand for other products, while further new projects are under active development. A long lease has been obtained of an adjacent factory with 10,000 sq ft of production floor space.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	119,200	35,070	44	15	43/9	38/3
1952	134,807	34,283	43	15	37/6	31/6
1953	214,725	41,801	50	20	47/6	36/3
1954	202,283	52,765	63	15	60/6	43/–
1955	152,904	66,304	76	15	62/–	55/6

Bowthorpe Holdings Ltd.

Application lists are to open and close today, 14 July, for the 550,000 2s. Ordinary shares which are being offered at 8s. 9d. each. Underwriting has been completed by Jas. Flower and Sons. The company was formed in 1949 to acquire Bowthorpe Electric Co., Bowthorpe Engineering Co., and Hellerman. Since then, two more subsidiaries, Line Equipment Ltd., and Cheltenham Plastics Ltd. have been acquired. Turnover for the first five months of the current year is running higher than the average for 1954, it is stated. The share capital consists of £37,500 in £1 6% Cumulative Redeemable Preference, for which a quotation is not now being sought, and £300,000 in £2 Ordinary shares.

Dubilier Condenser Co. (1925) Ltd.

Trading profit for the year to 31 Mar. last is £265,357 (*£353,000*), but the dividend is maintained at 25% on the capital increased by a one-for-four scrip issue.

Electric and General Investment Co.

The net profit for the year to 31 May is £23,463 (*£13,961*), and the Ordinary dividend is 14% (*10%*).

Electric Construction Co. Ltd.

An all-time record in sales was achieved, and although orders in hand are slightly less than last year, they are considered satisfactory by Mr C. Reid, the chairman. The South African factory is now in production and has found a ready sale for its products, but sales by the Canadian concern have been disappointing. The development of business abroad will involve a certain amount of additional capital expenditure, which however, is included in the total of capital commitments of about £117,000 at 31 Mar. last.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	506,816	100,680	54	15	72/–	55/–
1952	535,930	99,220	53	15	57/–	42/6
1953	552,526	110,863	44	15	56/–	50/6
1954	566,535	110,526	42	15	35/6	26/6
1955	564,283	114,678	20	8½*	39/6	31/6

*Plus 100% capital bonus.

Ferranti Ltd.

Output of power transformers for the past year was 20% below that of the previous year, but the rate of input has now risen sufficiently to allow the output to be restored to its previous level, Sir Vincent de Ferranti, the chairman, reports. Orders for moving coil regulators have doubled, and distribution transformer business continues at a satisfactory level. The output of insulation tubes and cylinders continued to rise, while the electricity meter business remained steady. The factory at Dundee built up its planned output last year. New designs are well advanced in the laboratories at Granton and it is hoped to introduce these into Dundee in the near future. The output of Government products remains steady, and further long-term development work has been undertaken in connection with guided missiles. Additions to space and the introduction of automatic processing and handling equipment for the production of radio and TV receivers should assist in meeting still further increased demands later this year. A considerable expansion in manufacturing facilities for c.r. tubes is to come into operation shortly.

Year to 30 June	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid
1951	1,427,467	540,129	192	6
1952	1,531,832	529,208	180	6
1953	1,575,319	436,248	72	6†
1954*	1,673,467	546,863	92	6
1955*	1,595,185	576,605	89	6

*Period to 31 March. †Plus 200% capital bonus.

Hackbridge and Hewittic Electric Co. Ltd.

The increase in the trading surplus for the past year reflects the effect of measures taken to improve designs and manufacturing methods, Mr A. M.

Browne, the chairman, states. Extensions to the factory and offices have been completed, but further process and test equipment and extensions to the factory are

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	379,331	142,720	51	18	18/7	15/4
1952	464,737	158,546	58	20	17/–	13/3
1953	459,351	154,158	54	20	18/4	16/1
1954	504,303	167,767	58	25	25/6	16/10
1955	524,931	213,284	72	30	29/9	23/9

required. To finance this work, a further 200,000 5s. Ordinary shares are to be offered at 12s. 6d. each on a one-for-ten basis. The transformer division achieved its greatest output in large transformers last year, Mr Browne reports. Competition overseas is extremely keen, particularly from continental manufacturers, but orders have been obtained at a sufficient rate to ensure full output in all divisions during the coming year.

Hick, Hargreaves and Co., Ltd.

For the year ended 31 Mar. last the profit, after charging taxation, is £259,706, compared with £208,107 for the previous year. A final dividend of 15% and a bonus of 5%, make the total distribution 25%. In the previous year, an interim of 5% was followed by a one-for-two scrip issue, and a final of 15% on the larger capital.

Jamaica Public Service Co., Ltd.

Net income, after tax, for the year ended 31 Dec. last, amounts to £224,769, compared with £180,074 for the previous period. For the satisfactory increase in the company's operations, the improvement in the standard of living throughout the Island is largely responsible. The company's accelerated construction programme required the expenditure of £633,099 during the year to meet growing demands and to anticipate additional future requirements.

Kalgoorlie Electric Power and Lighting Corpn.

It has become necessary to suspend the obligation to pay instalment of interest on the 5% Convertible Redeemable Debentures due 30 June and 31 Dec. next until 30 June, 1956. The company is also suspending its obligation to redeem £50,000 of the stock for a year until 31 Dec., 1956, and also proposes that the right of conversion into Ordinary shares be extended a year to 30 Nov., 1956. The reasons given for these proposals include an excess of £132,000 over the estimated cost for new plant, seriously depleting the liquid assets with £50,000 still owing to the manufacturers, large increases in the price of coal, and the loss of one of the largest consumers who has converted to diesel-generating. Negotiations are in hand with Western Mining to take over all the power supply to that group "at an economic price." If debenture holders agree to suspension, an agreement will be made with Western Mining, and this, with savings in using wood fuel in place of coal, "holds out real prospects of a marked recovery" in the company's position, it is stated.

Marryat and Scott Holdings Ltd.

The favourable trend continues, and the volume of work in hand both in numbers of machines and in value of contracts is again a record figure, representing sufficient to keep production

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	92,978	39,013	61	22½	6/7	5/–
1952	113,117	37,088	58	22½	5/10	5/1
1953	140,170	45,363	70	22½	6/3	5/1
1954	129,583	47,814	77	25	10/–	5/2
1955	152,686	148,313	107	30	11/9	9/3

capacity fully employed for at least 12 months Mr Murray D. Scott, the chairman, reports. Extensions to the Hounslow works of Marryat and Scott are now almost complete, as is also the rebuilding of a section of offices and stores of Marryat and Place at Hatton Garden.

Motor and Electronics Corpn. Ltd.

This concern, which in addition to its motor components range, manufactures a wide variety of electrical switches, relays, solenoids and electronic components, is seeking additional working capital to facilitate the development and expansion of the business of the group. In particular, the electronic division, which has American connections, is to be further expanded. It is therefore proposed that the present unissued 1,125,667 Ordinary 1s. Shares be issued as follows: 968,583 shares by capitalisation of reserves to Ordinary shareholders, and 125,000 to be offered to Preference holders, while 32,084 shares are to be sold in the market for cash. Preference shareholders are to be offered 125,000 new 5% Preference shares of £1 each. It is proposed to increase the authorised Preference share capital by £375,000 and the Ordinary share capital by £250,000 which, after the issue of £125,000 of new Preference capital noted above, will leave £250,000 of each class of capital available for future issue as and when required.

Oldham and Son

Group profits, before taxation, for the year to 31 Mar. last is £452,958 (*£350,967*). A final dividend of 12½% makes the total 20% (*17½%*).

Radiovisor Parent Ltd.

Trading profit, etc., for the year ended 31 Mar. is £24,377 (*£13,078*), and the dividend is increased to 25% (*8½%*). It is proposed to make a scrip issue of three 1s. Ordinary shares for every five held.

Richardsons, Westgarth and Co. Ltd.

Steps are being taken to place the group in a position to participate in atomic developments for land and marine purposes, Mr O. J. Philipson, the chairman, states. The company has orders from the C.E.A. for a further six turbo-alternators aggregating 240 MW which, together with similar plant, water tube boilers and other equipment for industrial customers, will ensure a period of intense activity at Hartlepool. The company's first gas turbine contract—a 2,500 kW unit for the Shelton Iron, Steel and Coal Co., to be fired by blast furnace gas or alternatively heavy fuel-oil is now in hand at Hartlepool.

Ruston and Hornsby Ltd.

By the capitalisation of reserves, for which C.I.C. consent has been obtained, 2,050,000 Ordinary shares of £1 each are being issued to holders in the proportion of one new for every £2 of Ordinary stock. To bring the capital to the round figure of £7 millions, it is proposed to create 2 million new £1 Ordinary shares, the balance being provided by designating 50,000 existing unclassified shares of £1 each as Ordinary shares.

Telegraph Construction and Maintenance Co.

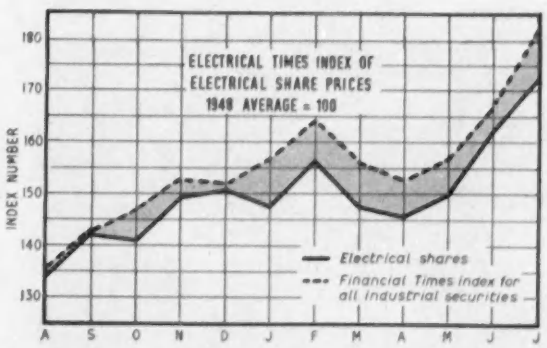
It has been decided to issue 977,046 Ordinary shares in the existing share capital at a price of 32s. 6d. each, to be offered in the proportion of one-for-two. The remaining 68,862 shares in the existing Ordinary capital are being reserved for offer at a later date to the employees of the company under a scheme which is in course of preparation. The company's interest in a newly-formed Canadian concern to manufacture telephone cables is noted on page 64. It has also acquired the whole of the undertaking of Magnetic and Electric Alloys Ltd.

Telephone Manufacturing Co. Ltd.

Consent of the Capital Issues Committee has been received to the proposed one-for-five scrip issue.

Ultra Electric (Holdings) Ltd.

Applications from stockholders for the 380,000 5s. "A" Ordinary shares at 12s. 6d. each totalled 837,000 shares, it is announced



The rise in share prices continues. "The Financial Times" index for all industrial shares rose by as much as 15·3 to 182·2 during June, although this included a slight fall at the end of the month. At the same time, the "Electrical Times" index for all electrical shares rose by 9·2 from 162·6 to 171·8

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

16 July—Hoyland Nether U.D.C. Installation of wiring and fittings in 30 bungalows at Milton, L. K. G. Barraclough, housing surveyor, Town Hall, Hoyland, near Barnsley.

19 July—Durham C.C. Electrical installations in Dinsdale Pk Residential School, Hookergate Grammar School, and Wincanton C.E. (Controlled) School. Apply by above date to county architect, Court Lane, Durham.

20 July—Ebbw Vale U.D.C. Supply, delivery and erection for No. 1 scheme, Cemetery Corner to Eureka Place: 20 concrete columns, 27 brackets, 47 lanterns with 400 W mercury vapour lamps, auxiliary gear and wiring; For No. 2 scheme, Libanus Road to Cambridge Gardens: 32 brackets and lanterns, with 400 W m.v. lamps, etc.; For No. 3 scheme, Badminton Grove to Trunk Rd, Beaufort: 22 concrete columns, 8 brackets and 30 lanterns with 400 W m.v. lamps, etc. H. J. Williams, acting clerk, council offices, Ebbw Vale.

21 July—Boston T.C. Electrically and one diesel operated vertical spindle centrifugal pumps, and ancillary equipment for West Side sewerage scheme.—See 30 June issue.

21 July—Kidsgrove U.D.C. Electrical installations at Rookery estate (*a*) in 18 dwellings, (*b*) 10 dwellings, (*c*) 10 dwellings and (*d*) 30 dwellings, and at Galleys Bank estate; (*e*) in 10 dwellings, and (*f*) 30 dwellings. C. Clarke, architect, Town Hall, Kidsgrove. Deposit £1. 1s.

21 July—Merton and Morden U.D.C. Supply and erection of approx. 68 fluorescent and 60 250 W mercury vapour street lighting lanterns, with control gear and wiring, on 25 ft concrete columns, in High St, Kingston Rd, Martin Way and Morden Hall Rd. Particulars from engineer and surveyor, Morden Hall, S.W.19.

22 July—Derby T.C. Installation in 100 houses at Chaddesden and Mackworth.—See 7 July issue.

22 July—Longbenton U.D.C. Electrical installations in 30 houses at Fordley estate, Section V. A. E. Sweetman, engineer and surveyor, Council Offices, Forest Hall, Longbenton. Deposit £2. 2s.

22 July—Warwick T.C. Steel columns with fluorescent lanterns for class A street lighting along A.41.—See 7 July issue.

23 July—Girvan T.C. Electric lighting installations in 40 houses at Mote site. Apply by above date to S. Valentine, town clerk, Town Clerk's Chambers, Girvan.

23 July—Hastings T.C. Installation at secondary modern school, Red Lake.—See 30 June issue.

23 July—Ince-in-Makerfield U.D.C. Installation in 20 houses on Battersby St site.—See 7 July issue.

23 July—Kirkcaldy T.C. Electrical work at the Water Department's houses at Lothrie and Holl, and also at the filter house at Holl. Particulars from the water engineer, Town House, Kirkcaldy.

23 July—Lichfield T.C. Steel columns, sodium and fluorescent lanterns for Group A lighting along B.5312.—See 7 July issue.

25 July—Castle Douglas T.C. Installation in extension to town hall.—See 7 July issue.

25 July—Durham T.C. Supply and erection of 15 250 W mercury vapour lighting units at Neville's Cross Bank. City engineer, Town Hall, Durham.—Advertised in this issue.

25 July—Manchester T.C. Installation at Kirkmanshulme grammar school.—See 30 June issue.

25 July—Northern Ireland. Electrical engineering installation in new ward block at Royal Victoria Hospital, Belfast, comprising lighting, power sockets, emergency lighting, signalling and radio installations. Details from the consulting engineer, W. J. Ogle, 63 Main St, Bangor, Co. Down. Deposit £10. 10s.

26 July—Ilford T.C. (*a*) Supply only of 214 25 ft concrete columns; (*b*) erection and connection of same with lanterns, lamps, jackets and control gear; (*c*) supply only of 214 140 W SO/H enclosed lanterns; and (*d*) supply only of 214 140 W SO/H lamps, vacuum jackets and control gear. Borough engineer, Town Hall, Ilford. Deposit £2. 2s. each. Advertised in this issue.

26 July—Llwchwr U.D.C. Supply and erection of 7 columns and fitting 7 lanterns and auxiliary equipment—140 W sodium—on trunk road A.48 at Penllergaer Roundabout. Engineer and surveyor, Council Offices, West St, Gorseinon, Swansea.

27 July—Prestwich T.C. Conversion of 490 existing gas lamps to tungsten lighting, and the provision of 35 additional tungsten lighting points on reinforced concrete columns. Borough engineer, Town Hall, Prestwich. Deposit £2. 2s.

27 July—Swansea T.C. Installation in Technical College workshops, Mount Pleasant.—Advertised in 7 July issue.

28 July—Brighouse T.C. (*a*) Supply of 61 400 W mercury discharge units with control gear and time switches, and (*b*) the provision and erection of 61 25 ft reinforced concrete columns and brackets and the installation of equipment in (*a*). Borough engineer, Commercial St, Brighouse. Deposit £1.

28 July—Middleton T.C. Supply of 130 lanterns for sodium lamps, 160 bowl type lanterns for tungsten lamps, 350 globe type lanterns, including gallery and lamp unit for tungsten lamps, and 144 swan neck brackets and control boxes for lighting conversion scheme. Borough engineer and surveyor, Town Hall, Middleton.

30 July—Ashbourne U.D.C. Two sets of automatically controlled vertical spindle sewage pumps, with slip-ring motors, starters, etc. Particulars from D. Powell, engineer and surveyor, Compton Offices, Ashbourne.

30 July—Bury T.C. Supply and installation of public address system for the Market Hall and the Open Market. Particulars from the Markets Superintendent, Market Hall, Bury.

30 July—Sleaford (Lincs) U.D.C. Mercury discharge units with control gear, concrete columns and cast-iron brackets, along class B roads.—See 7 July issue.

31 July—Cheshire. Applications invited for inclusion in approved list of contractors.—See 7 July issue.

1 Aug.—Stornoway T.C. Electrical installation in 14 houses in Newton St. Names by above date to Gratton and Maclean, chartered architects, 21 Woodside Terr, Glasgow.

2 Aug.—Sheffield T.C. Electrical installation at Chaucer Secondary Modern School, off Halifax Rd. J. L. Womersley, city architect, City Architects Department, Town Hall, Sheffield 1. Deposit £2.

3 Aug.—Worsley U.D.C. Supply and erection of columns and fittings for a 140 W sodium discharge lighting scheme on Clegg's Lane, Armitage Ave and Peel Ave. Particulars from L. T. Broome, engineer and surveyor, Town Hall, Walkden. Deposit £2. 2s.

4 Aug.—Coppull (Lancs) P.C. Sodium discharge street lighting units for trunk road A.49.—See 30 June issue.

11 Aug.—Belfast T.C. Passenger/goods lift of 2,000 lb capacity at Power Station West.—Advertised in 30 June issue.

13 Aug.—Halifax T.C. Supply and installation of two automatic, electrically driven pumps, 12,000 g.p.h. against 300 ft head. Waterworks engineer and manager, Gibbet St, Halifax. Deposit £2. 2s.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 87 queries answered this week

"Progress" bench-drilling machines, makers of? C.E.—B. Elliott and Co., Ltd., Victoria Rd, N.W.10.

"Laco" conduit benders, makers of?—W.C.—Lawler Ayers and Co., Ltd., 54 Old Broad St, E.C.2.

"Premier" baby alarm system, makers of? L.E.—Premier Radio Co., 207 Edgware Rd, W.2.

"Itonia" irons, address for spares? S.W.B.—H. Chapman, 71 Goldsworth Rd, Woking, Surrey.

"Dimit" dimming adaptor, address for? S.E.B.—Rynford Industries (1950) Ltd., 56 West End, Redruth, Cornwall.

"Telemaster" intercom sets, makers of? C.A.—Birmingham Sound Reproducers Ltd., 115 Gower St, W.C.1.

Water coolers (ice water dispensers), makers of? U.S.N.—Frigidaire Division of General Motors Ltd., Stag Lane, Kingsbury, N.W.9; Lightfoot Refrigeration Co., Ltd., Abbeydale Rd, North Circular Rd, Wembley; Ice Water Dispensers Ltd., 87/91 Shaftesbury Ave, W.1; Pressed Steel Co., Ltd., Cowley, Oxford; Non-Drip Measure Division of Gaskell and Chambers (London) Ltd., 109 Blackfriars Rd, S.E.1.

26 Aug.—Watford T.C. Installation in Central Technical Inst., Parnell St.—See 7 July issue.

1 Oct.—Islington B.C. Rewiring of the Council's Public Baths, Greenman St, Essex Rd, N.1. Details from general superintendent and engineer, Public Baths, Hornsey Rd, N.7. Advertised in this issue.

No date stated—N. of Scotland H.E. Board. 132 kV double and single circuit steel tower overhead lines around Aberdeen.—Advertised in 7 July issue.

No date stated—N. of Scotland H.E. Board. Lighting, heating and auxiliary power installation at Nairn substation. —Advertised in 7 July issue.

Date not stated.—N. of Scotland Hydro-Electric Board. Supply and erection of 33 kV lines for the turn-in of existing lines to Kintore substation. Details from Merz and McLellan, 72a George St, Edinburgh 2. Deposit £2. 2s. Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

1 Aug.—India. Supply of electrical equipment including transformer, h.t. panel, l.t. switchgear, power capacitor and h.t. power cable. Chief Mechanical Engr., Calcutta Port Commissioners, 8 Garden Reach Rd, Kidderpore, Calcutta. B.o.T. (Ref.: ESB 13489/55).*

5 Aug.—India. Manufacture, installation of about 3,100 yd of 33 kV solid type 3-core screened 0·4 sq in. supertension cables, etc., for Maithon hydro-electric power station. Tender No. ED-719-1. Chief Electrical Engr., Damodar Valley Corpn., Alipore, Calcutta. Deposit Rs. 30. B.o.T. (Ref.: ESB 13499/55).*

8 Aug.—India. Bombay Port Trust, Ballard Rd, Fort, invites tenders (E35/1955) requires initial equipment for primary substation "PS2" and secondary substation "SS6" in Victoria Dock, and/or 22 kV 6·6 kV and 420 V underground cables both outside and inside. B.o.T. (Ref.: ESB 13782/55).*

31 Aug.—Australia. Supply, erection, etc., of 132 kV, 66 kV and 33 kV circuit-breakers for Wide Bay-Burnett, Capricornia and Townsville Electricity Boards. Specif. No. 488. State Electricity Commission of Queensland, Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Ref.: ESB 13214/55).*

9 Sept.—New Zealand. Post Office invites tenders for 27 miles of various types of electrical cable. Contract No. P and T 150/8064. Director-General, Stores Div., G.P.O., Wellington.

14 Sept.—Australia. Supply of material, survey, erection, etc., of 132,000 V overhead transmission line between Tully Falls and Townsville. Specif: TF/35. State Electricity Commission of Queensland, Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Ref.: ESB 13922/55).*

20 Sept.—India. 132/33 kV power transformers, 132 kV and 33 kV oil circuit-breakers, 132 kV disconnecting air break switches lightning arrestors for 132 kV and 33 kV, etc., for Director-General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (Ref.: ESB 14287/55).*

20 Sept.—Iraq. Supply and erection of one 500 kW and two 250 kW a.c. generating sets, two 1,500 kVA transformers and associated h.v. and l.v. control switchgear, for Kut Town. Directorate General of Municipalities, Baghdad. B.o.T. (Ref.: ESB 13761/55).*

22 Oct.—Iraq. Tenders invited for supply, erection, etc., of electrical and other equipment for Karbala new water supply scheme. Directorate-General of Municipalities, Baghdad. B.o.T. (Ref.: ESB 13305/55).*

22 Sept.—Western Australia. Power and control cabling for Bunbury power station, for State Electricity Commission. B.o.T. (Ref.: ESB 14176/55).*

5 Nov.—Iraq. Supply, erection and supervision of operation of a power station for a complete sugar plant near Mosul. Particulars from Iraq Embassy in London.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 12 July

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	342	+12	239½
,, (3 months)	338½	+11½	237½
R.S.T. (Rhodesian Selection Trust) group price*	280	—	—
LEAD, refined pig, min. 99·97% purity (cash)	105½	+1½	96½
,, (3 months)	105¼	+1½	94½
TIN, refined, min. 99·75% purity (settlement)	733	+4½	759
,, (3 months)	730	+4	749
ALUMINIUM, ingots 99·99·5%	171	—	156
ZINC, virgin, min. 98% purity (cash)	91½	−½	78
,, (3 months)	91½	+½	78½
RUBBER No. 1, RSS. spot (per lb.)	38d.	—	21½d.
,, c.i.f. basis, ports. Aug. (per lb.)	35½d.	+½d.	21d.
ARMOURING :			
Galv. Steel Wire (0·104 in.)	54	—	52
Mild Steel Tape (0·014 in.)	41½	—	40½

(*Fixed price c.i.f., U.K. originally operative for 30 days from 9 May to "consumers willing to instil a degree of stability into the resale price." Pending new notification, price subject to change at 24 hr. notice.)

Contracts Placed

Ashton-under-Lyne. Renewal of electrical installation (phase 1) at General Hospital, S. Dickinson Ltd., £10,785 (recommended).

Chester T.C. Electrical installations at College of Further Education, Engineering Services Installations Ltd., £10,207 (recommended).

Liverpool T.C. Supply of nine pedestrian controlled battery electric vehicles, Sidney Hole's Electric Vehicles Ltd., £4,174.

Scunthorpe T.C. Wiring in 56 houses, C. F. Gaymer, £1,872 (recommended).

Wellington (Salop) U.D.C. Electrical installations in 64 houses, E. W. Jones (Electrical) Ltd.

Gazette Announcements

COMPANIES ACTS

Union Cable Co. Meeting of members at 16 Union Ct, Old Broad St, E.C.2, on 11 Aug., at 3 p.m., to receive report of Mr C. H. I. Chown, liquidator, on winding up.

Dudley Electrical (Wholesale) Supplies Ltd. First and final dividend of 3s. 11¾d. in £, payable on 20 July at Somerset House, 37 Temple St, Birmingham 2.

Empire Electric Co. (Hounslow) Ltd., of 189 Hanworth Rd, Hounslow. Mr N. W. Osborne, 11-12 Finsbury Square, E.C.2, appointed liquidator, with a committee of inspection.

Delhi Electric Supply and Traction Co., Ltd. General meeting at Winchester Hse, Old Broad St, E.C.2, on 19 Aug. at 2.30 p.m., to receive report of Mr W. D. Hume, liquidator, on winding-up.

BANKRUPTCY ACTS

Application for Discharge

Birmingham. Rose, Hyman, trading as Rose Electrical Service, 158 Soho Rd, Handsworth. Hearing at County Court, Newton St, Birmingham, at 10.30 a.m. on 19 Sept.

Release of Trustee

Bristol. Banwell, Arthur Henry, electrical and radio retailer, 4 Dominion Rd, Fishponds. Trustee, Mr P. W. Hort, 28 Baldwin St, Bristol 1, released as from 20 June.

Partnerships Dissolved

Glam. Victor John Bailey and Vernon Bailey, trading as V. J. Bailey, electrical and radio engineers, at Talbot Rd, Port Talbot. All debts will be dealt with by V. J. Bailey who is continuing the business.

Battersea. James Henry King and Stanley William King, trading as Kings Television Co., radio and television and electrical engineers, at 210 and 225 Lillie Rd, Fulham, and at 116/117 Borough Rd, Southwark, and at 46/48 Battersea Bridge Rd, Battersea. Partnership dissolved as from 30 June.

Receiving Orders

Kensington. Meyer, Frederick William James, electrician, 4 Dunsany Rd, West Kensington, W.14.

Birmingham. Pryke, George William Alfred, electrical contractor's manager, of Nether Whitacre, Coleshill, Birmingham.

London. Shearley, Lewis Clifford, electrician, lately trading at Manor Barn, Aldingbourne, Chichester, and now of 392 New Cross Rd, S.E.14.

Dividends

Warwick. Hammerton, Derek Gerald Henry, and Cummings, Arthur Joseph, trading as A.C.D. Electric Co., at 28 West St, Warwick. First and final dividend of 7d. in £, payable on 28 July at Official Receiver's Office, Somerset Hse, 37 Temple St, Birmingham 2.

Liverpool. Eagle, William Richard, electrical contractor, lately of 10 Houghton Chambers, 1 Houghton Place, Liverpool. Supplementary dividend of 1s. 6d. in £. payable on 20 July at office of trustee, Mr E. S. Browne, 41 North John St, Liverpool 2.

BUSINESS PROSPECTS

Home

Antrim. Erection of county library H.Q. at Demesne, Ballymena. Quantity surveyor, Ogilby and McCutcheon, 5 Lombard St, Belfast. Construction of meals centre for E. C. Quantity surveyor C. G. Dalyell, 6 Bath St, Porthrush.

Bristol. Governors of Clifton College propose £150,000 extensions.

Camberwell B.C. G. A. Walford and Partners, Byron Hse, St James's St, S.W.1, are quantity surveyors for 269 dwellings and 15 shops, Astley St, redevelopment, 52 dwellings in Camberwell Grove.

Carlton U.D.C. Erection of 50 houses on Florence Rd site. Engineer and Surveyor, E. C. Kirk, Council Hse, Burton Rd, Carlton.

Church (Lancs) U.D.C. To consider 144 houses near Church and Clayton cemetery for R. C. Petre of Dunkenhalgh estate.

Congleton B.C. Erection of 80 houses on Buglawton estate. Borough engineer and surveyor, Town Hall.

Dagenham T.C. To be recommended for Ministry approval 16 shops with 16 dwellings over—on Marks Gate estate.

Deptford B.C. Plans approved by L.C.C. for 40 flats at Breakspear Rd, No. 2 site.

Dublin T.C. Eire. Erection of 196 houses at Coolock-Raheny housing area. Housing Architect, 6 Mountjoy Sq.

Durham. County E.C. considering renewal of electrical installation at Framwellgate Moor and Hetton Lyons county schools and Kimblesworth county mixed school. Proposed to install electricity in Horden Colliery junior boys school and Hartlepool Baltic St county school.

Epsom. Extensions including a kitchen £34,437 to Glyn county secondary school approved by C.C.

Harlow. Donald Hamilton, Wakeford and Partners are architects for 59 shops in town centre for Ravenseft Properties Ltd., 52 Charles St, W.1.

Hemel Hempstead. Franklin and Andrews, 173 Fleet St, E.C.4, are quantity surveyors for a bank at Bank Close for Lloyds Bank Ltd.

Kensington B.C. To be recommended that architect E. V. Harris, 19 West Eaton Place, S.W.1, proceed with sketch plans for £750,000 Town Hall and central library at the Abbey site.

Luton. Plans approved for 94 dwellings and 22 garages for New Ideal Homesteads Ltd., Mead Hse, South St, Epsom.

Middlesbrough T.C. Recommended to approve extensions to factory B.T. 28/6 East Middlesbrough trading estates for North Eastern Trading Estates Ltd.

Also, Cairns and Byles, 8 Osborne Rd, Newcastle-on-Tyne are heating and electrical consultants for kitchen/dining rooms at Archibald school and assembly hall at Danegarth county primary school.

Middlesex C.C. Recommended to approve £206,120 Rhodes Ave secondary modern school, Wood Green.

Moneyreagh (Co. Down). Erection of 29 dwellings for N.I. Housing Trust, 12 Hope St, Belfast.

Newcastle-on-Tyne. Prof W. B. Edwards and Partners, 52 Eldon Place, are architects for 5-storey extensions at King's College.

Newcastle-on-Tyne T.C. Thos. Barrett, Sons and Partners, Brunswick Place, are quantity surveyors for stage 1 of new Town Hall. Proposed £70,000 bus station site clearance to begin. City Engineer, P. Parr, Town Hall.

Northumberland. County secondary school, £160,462, at Bedlington West approved by E.C.

Prudhoe (Northumberland). Erection of 50 bed villa for women patients for Newcastle Hospital Board. Board's Chief Architect, Benfield Rd, Newcastle-on-Tyne.

Sauchie. Erection of 84 houses on Post Hill site. Scottish Special Housing Association Ltd., 15/21 Palmerston Place, Edinburgh 12.

Seaford U.D.C. Erection of 36 houses on Chyngton site. Engineer and Surveyor, C. G. Thompson, Municipal Bldgs.

Stockton-on-Tees T.C. Recommended to approve extensions to store at 149 High St, for M. Robinson and Sons Ltd., and workshops, etc., in Church Rd, Maritime St, for Hugill Forge Co., Ltd.

Sunderland. S. W. Milburn and Partners, 9 Esplanade, are architects for proposed factory extensions for Thorn Electrical Industries. Richardson Westgarth group £400,000 developments to Geo. Clarke Ltd. works, Southwick and North-Eastern Marine Eng. Co., Ltd., South Docks.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Vandervell Industries Ltd. To acquire and hold shares, stocks, debentures, etc. Power is taken to carry on business of general, mechanical and electrical engineers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: G. A. Vandervell, Brockhurst Park Stoke Poges (co. dir.), W. T. Robins, F.S.A.A., Foxhole, Bolney, Sussex.

Spencer-West Ltd. Quay Works, North Quay, Gt. Yarmouth. To acquire the goodwill of the business of electronic engineers and instrument manufacturers carried on as "Spencer-West" at Gt. Yarmouth. Nom. cap.: £10,000. Dirs.: S. S. West (permt. mang. dir.) and Mrs A. West.

Lawrence Lee Ltd. To take over business of an electrical contractor carried on at 8 Red Bank Road, Bispham, Blackpool by Lawrence Lee. Nom. cap.: £2,000. Permt. dirs.: L. Lee (ch) and Mrs E. Lee.

Musiectric Ltd. Designers, manufacturers of and dealers in electrical, electronic, mechanical and musical apparatus, etc. Nom. cap.: £100. Dirs.: J. E. Newman and Ivy D. Newman, 5 North Rd, West Drayton, Middlesex.

Newburn Television Co., Ltd., 53/5 Westmorland Rd, Newcastle-on-Tyne. Nom. cap.: £100. Dirs.: A. W. Wanless, J. G. Barclay, E. S. Pietrasz Kiewicz and L. A. Gull.

Britton Electronic Co., Ltd., 242 Kingston Rd, New Malden, Surrey. Nom. cap.: £100. Dirs.: R. W. Britton and Mrs F. K. Britton.

Deacons Electric Ltd., 43 Old Shoreham Rd, Portslade, Sussex. Electrical engineers and contractors, etc. Nom. cap.: £2,000. Dirs.: D. J. Glenister and Mrs G. Glenister.

Trade Notes

S.A. Duty. A new decree of the South African Government provides for the imposition of an "ordinary" dumping duty on various types of electrical accessories such as plugs and sockets, switches, lampholders, adaptors and iron connectors.

Holidays. The works of Transformers (Watford) Ltd., will be closed from 29 July to 16 Aug.

Full Production. Jones, Stroud and Co., Ltd., Highfield Mills, Canal St, Long Eaton, Nottingham, inform us that their insulating materials are now back in full production again, having made good the considerable damage to the varnishing building and plant as the result of the fire at the works last month. About 6,000 sq ft was gutted, but with the co-operation of the builders and oven makers, the whole has been re-roofed and the ovens rebuilt.

Agents. W. and H. Nelson Ltd., have appointed the British Flottman Drill Co., Ltd., of Cardiff, as their agents for South Wales.

Asquisition. E. K. Cole Ltd., have acquired a controlling interest in Dynatron Radio Ltd.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Colomil. 735,720. Class 7. Crushing, grinding, milling and pulverising machines. Flint and Brown Ltd., Parliament Mansions, Abbey Orchard St, S.W.1.

Megasil. 741,512. Class 17. Resins and varnishes all for insulating purposes. Midland Silicones Ltd., 19 Upper Brook St, W.1.

President. 728,518. Class 7. Motors. Utilex Tool Co. Ltd., 4 Partington St, Oldham, Lancs.

Reporter. 736,930. Class 9. Radio, television, telecommunication apparatus, etc. Pye Ltd. Radio Works, St Andrew's Rd, Cambridge.

TELEPHONE MANUFACTURING CO.

THE 25th annual general meeting of Telephone Manufacturing Company Limited was held on 11 July in London, Mr Fred T. Jackson, O.B.E., COMP.I.E.E. (Chairman and Managing Director), presiding.

The following is an extract from his circulated statement:

Activity in all branches of your Company's business was maintained at a high level.

Export business continued during the year at the rate of 20% of our turnover with incoming orders at a slightly higher rate, though I am sorry to say that in many cases the prices are unremunerative as a result of intense competition.

The supply of Subscribers Apparatus, i.e. Telephone Instruments, Manual Switchboards and allied Apparatus to the British Post Office has been at a somewhat higher level during the year under review and it is good to know that at last there is to be some relaxation in the Treasury restrictions on the activities of the British Post Office.

In March this year there was another Wage Award in the Engineering Industry. It has to be realised by those concerned that these Wage Awards which have become an annual feature, unless accompanied by an increase in the productivity of each individual can only result in higher prices and a lowering of the standard of living. Furthermore, there is a danger of pricing ourselves out of the export markets on which this country depends for its survival.

The report was adopted and a total dividend of 10% was approved.

"Light as Glass

. . . white and shining as silver, almost as unchangeable as gold, malleable and ductile . . . strong as Iron . . .". That was Aluminium — as the French felt about it in 1855; the year when aluminium first appeared at the Paris Exhibition; the year Napoleon III ordered a rattle of aluminium for his son.

Such wonderful exciting metal to the world of 1855. The possibilities? Enormous. The price? Prohibitive. Aluminium remained a precious metal until electrolytic extraction was patented in 1886.

Then, nearly a hundred years after the Prince Imperial's rattle was made, modern aluminium techniques were applied to the sheathing of power cables. Henley's today offer to the electrical industry the finest aluminium-sheathed cable obtainable.

- Easily installed — comparative rigidity.
- Are considerably lighter than the equivalent lead-sheathed Cable.
- Give superior mechanical protection.
- Have smooth, clean and tidy appearance.
- Permit fewer supports.
- Resist vibration.

ALUMINIUM SHEATHED CABLES by HENLEY

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

'ENGLISH ELECTRIC', the world-famous manufacturers, use FRY'S Alcho-Re flux in many soldering processes. The above picture (reproduced by kind permission of The English Electric Company Limited) shows the flood-soldering of armature coil leads to the commutator of a DC traction motor. Throughout this process Alcho-Re flux is used for all soldering.

when it's Safety First – use ALCHO-RE FLUX

Alcho-Re fluxes are exceptionally fast in operation, ensure a good spread of solder and are guaranteed non-corrosive. FRY'S Alcho-Re fluxes conform to specification DTD 599 and can be released through our own AID or ARB organisations. Please write for samples and copies of our booklet "*Fluxes for electrical work*".

FRY'S Metal Foundries Limited

TANDEM WORKS, MERTON ABBEY, LONDON, S.W.19.

TELEPHONE: MITCHAM 4023

and at MANCHESTER · GLASGOW · BRISTOL AND DUBLIN

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

COUNTY BOROUGH OF SWANSEA
Technical College Workshops, Mount Pleasant, Swansea

TENDERS FOR (1) COLD WATER, GAS INSTALLATION, HEATING AND HOT WATER INSTALLATION, AND (2) ELECTRICAL INSTALLATION

FIRMS wishing to Tender for (1) the Cold Water, Gas Installation, Heating and Hot Water Installation, and (2) Electrical Installation at Technical College Workshops to be erected at Mount Pleasant, Swansea, are invited to submit their applications to the Borough Architect, The Guildhall, Swansea, on or before Wednesday, 27 July, 1955.

Plans, Specifications and Conditions of Contract can be obtained on deposit of £2 for each Tender, provided the applicant gives satisfactory evidence of experience in work of a similar character.

The deposit will be refunded after delivery of a bona fide tender (not subsequently withdrawn) and the return of all documents.

No guarantee is given that the lowest or any other Tender will be accepted.

T. B. BOWEN,
Town Clerk.

The Guildhall,
Swansea.
1 July, 1955. (T 444)

CITY OF DURHAM
Neville's Cross Bank

STREET LIGHTING

THE City Council invites tenders for the supply and erection of 15 250 W mercury vapour lighting units at Neville's Cross Bank, Durham.

Further details and form of tender may be obtained from the City Engineer, Town Hall, Durham.

Tenders enclosed in plain sealed envelopes and endorsed "Street Lighting" but not bearing any name or mark indicating the sender, must be delivered at my office on or before 9 a.m. on Monday, 25 July, 1955. The Council's standing orders provide that no tenders will be received except those sent in complying with the above direction.

The Council does not bind itself to accept the lowest or any tender.

D. B. MARTIN-JONES,
Town Clerk.

32 Claypath,
Durham.
8 July, 1955. (T 498)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
ABERDEEN TRANSMISSION DEVELOPMENT

TENDERS are invited for the supply and erection of 33 kV lines for the turn-in of existing lines to Kintore Substation. Tender Documents may be obtained on application with a cheque for £2. 2s. (returnable) to the Engineers, Messrs. Merz and McLellan, 72a George St, Edinburgh 2. The Board do not bind themselves to accept the lowest or any Tender.

H. W. SIMPSON,
Secretary.

16 Rothesay Terr,
Edinburgh 3. (T 465)

BOROUGH OF ILFORD
STREET LIGHTING—EASTERN AVENUE—PART II
TRUNK ROAD—A12

TENDERS are invited for the supply and/or erection of the following equipment:

- Tender (A) Supply only of 214—25 ft concrete columns.
- Tender (B) Unloading, erection and connection of 214—25 ft columns, Lanterns, Lamps, Jackets and Control Gear.
- Tender (C) Supply only of 214—140 W SO/H Enclosed Lanterns.
- Tender (D) Supply only of 214—140 W SO/H Lamps, Vacuum Jackets and Control Gear.

Copies of the Specifications and Forms of Tender for (A), (B), (C) and (D) may be obtained from the Borough Engineer and Surveyor, Town Hall, Ilford, on deposit of £2. 2s. in respect of each contract, which will be refunded on receipt of a bona fide tender not subsequently withdrawn.

The Drawings, Special and General Conditions of the Contract may be inspected at the Borough Engineer and Surveyor's Department.

Tenders in the enclosed envelope which will be supplied must be delivered to the Town Hall, Ilford, not later than 4 p.m. on Tuesday, 26 July, 1955.

The Corporation do not bind themselves to accept the lowest or any tender. (T 453)

METROPOLITAN BOROUGH OF ISLINGTON

TENDERS are invited for the rewiring of the Council's Public Baths, Greenman St, Essex Rd, N.1.

Particulars and forms of tender may be obtained from the General Superintendent and Engineer, Public Baths, Hornsey Rd, N.7.

Tenders, enclosed in the specially-marked envelopes provided, must be delivered to the undersigned not later than noon on Saturday, 1 Oct., 1955.

The Council do not undertake to accept the lowest or any tender.

H. DIXON CLARK,
Town Clerk.

Town Hall, Upper St,
Islington, N.1. (T 464)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

CENTRAL ELECTRICITY AUTHORITY
North West, Merseyside & N. Wales Division

VACANCY No. E.182/253/T—SHIFT CHARGE ENGINEER, St. Helens Generating Station. Salary £715/£760 (E.7).

Applications to Division Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, before 22 July. Quote vacancy No. (T 502)

LONDON ELECTRICITY BOARD
DEMONSTRATOR (FEMALE)

APPLICATIONS are invited for the above position in the Dartford/Erith District of the Board's South Eastern Sub-Area.

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate including electrical housecraft, and have experience in conducting demonstrations at Service Centres and in general service centre duties. They should also be experienced in advising consumers on the selection and use of domestic electrical appliances, both at the Service Centre and on consumers' premises.

The post is graded within the National Joint Council agreement (Administrative and Clerical Grades) as Grade 1, i.e. £425/£525 per annum, plus the appropriate London Area Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, London, E.C.2, to be returned completed by 23 July, 1955. Please enclose addressed envelope and quote ref.: V/1958/T. (T 463)

WAR OFFICE

VACANCIES exist for mechanical and electrical engineering draughtsmen in the designs branch of the Directorate of Fortifications and Works, War Office, Chessington, Surrey.

MECHANICAL DRAUGHTSMEN—(H and V)—applicants must have knowledge and experience of design of low-pressure hot water heating and domestic hot water supply installations. O.N.C. in Mechanical Engineering or equivalent is essential.

ELECTRICAL ENGINEERING DRAUGHTSMEN—applicants must have several years' experience in the preparation of schemes for the illumination and electrical equipment of buildings or in electrical distribution of H.V. and M.V. O.N.C. in Electrical Engineering or equivalent is essential.

Applicants must be British of British parentage.

Salary range is £432 (at 21)—£680 plus overtime. Starting pay according to age, qualifications and experience, with annual increases subject to satisfactory service. Prospects of promotion and establishment. Canteen facilities.

State age, full details of training and experience to Secretary of State for War, War Office (C.5.A) R.503, Northumberland House, London, W.C.2. (T 196)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

North Staffordshire Sub-Area

FOURTH ASSISTANT ENGINEER required in the North Staffs Sub-Area.

The appointment is for Shift Duties at the Stoke-on-Trent Common Service Control Centre, Parkway, Hanley. Salary £675/£720 per annum (N.J.B. K.13).

The successful applicant will be required to assist the Distribution Shift Control Engineer in the operation of the Sub-Area Transmission and Distribution System.

Applicants should have a knowledge of System Operation and loading. Experience in generation and the operation of Supervisory Controlled Substations would be an advantage.

Apply in writing within 14 days to Sub-Area Manager, Midlands Electricity Board, 31 Kingsway, Stoke-on-Trent.

Shropshire and Herefordshire Sub-Area

SENIOR SERVICE CENTRE ASSISTANT (Male) required.

Duties involve the supervision of Service Centre and the promotion of sales of electricity and electrical appliances. Experience essential. Salary £585/£645 per annum (N.J.C. Grade 3).

Apply in writing, within fourteen days, stating age, experience and present position to District Manager, Midlands Electricity Board, Broadway, Haygate Rd, Wellington, Salop.

A. STEPHENS,
Secretary.
(T 516)

CENTRAL ELECTRICITY AUTHORITY
South Eastern Division

1. ASSISTANT ENGINEER (WORKS OFFICE CO-ORDINATION)—CROYDON "A" AND "B" POWER STATIONS

THIS position requires a man of balanced personality, with the ability to promote new ideas and to co-ordinate the wide field of generating station activities through the existing works-office organisation. Applicants should possess sound technical qualifications and have had experience in a modern engineering industry. Class K, Grade 7, £975/£1,050 per annum.

2. ASSISTANT ENGINEER (PROJECTS)—CROYDON "A" AND "B" POWER STATIONS

The position requires initiative coupled with an analytical and enquiring mind, and the successful applicant will be engaged on projects, designed to improve the efficiency of the power station in all aspects. He will be responsible for the initiation and carrying out of such schemes. A sound knowledge of modern power station practice and the possession of Higher National Certificate or equivalent would be desirable. Class K, Grade 9, £840/£900 per annum.

3. GENERAL ASSISTANT ENGINEER (CHEMIST)

on Divisional Headquarters Staff based at Croydon "B" Power Station.

Applicants should possess O.N.C. (Chemistry) or equivalent qualification and possess a sound knowledge of elementary Chemistry. Class AX/DX, Grade 7, £475/£550/£610 per annum.

4. SECOND ASSISTANT ENGINEER

to take charge of the Croydon District of the Transmission Department based at Croydon "B" Power Station.

Applicants, who should preferably be Corporate Members of the Institution of Electrical Engineers, should have had extensive experience in construction and operation of E.H.V. transmission equipment and experience in Joint Consultation and Conciliation. Class AX/DX, Grade 2, £950/£1,075/£1,165 per annum.

5. FOURTH ASSISTANT ENGINEER—CROYDON TRANSMISSION DISTRICT based at Croydon "B" Power Station.

Duties will include the issuing of permit-to-work cards and the supervision of maintenance and construction work on grid equipment. Class AX/DX, Grade 6, £600/£725/£785 per annum.

6. ASSISTANT ENGINEER (PROJECTS)—LITTLEBROOK POWER STATION

For details of duties see No. 2, Class L, Grade 9, £900/£975 per annum.

All Salaries subject to addition of London Allowance.

Applications giving details of general and technical education, training, experience, etc., should be sent to the following:

1 and 2—Station Superintendent, Croydon "B" Power Station, Beddington Rd, Croydon, Surrey.

3, 4 and 5—Establishments Officer, Central Electricity House, Lower Ham Rd, Kingston-on-Thames, Surrey.

6—Station Superintendent, Littlebrook Power Station, Nr. Dartford, Kent. Closing date 23 July. (T 517)

CENTRAL ELECTRICITY AUTHORITY
South Western Division

TECHNICAL STAFF VACANCIES—EAST YELLAND POWER STATION

(*a*) 2ND ASSISTANT STATION CHEMIST, N.J.B. Class G, Grade 11, £635/£680.

(*b*) GENERAL ASSISTANT ENGINEER (Chemist), N.J.B. Class G, Grade 15, £475/£520.

Superannuation.

Applicants for (*a*) should have had practical Power Station experience, particularly in the analysis of coal, water, and oil, etc., and possess as a minimum qualification the H.N.C. in Chemistry or equivalent.

For (*b*) should have had practical laboratory experience, preferably Power Station and should possess as a minimum qualification the O.N.C. in Chemistry or equivalent.

Applications on Form A.E.6/ACT. obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 31 July, 1955. (T 485)

MECHANICAL AND ELECTRICAL ENGINEERS
In Various Government Departments

THE Civil Service Commissioners invite applications for pensionable posts in a wide variety of mechanical and electrical engineering duties.

Candidates must be under 35 on 1 Jan., 1955, with extension for regular service in H.M. Forces and up to two years for permanent civil service. For the Post Office they must be at least 21, for the Ministry of Supply, and Ministry of Transport and Civil Aviation (Civil Aviation Organisation) at least 23; for other posts at least 25 on that date.

Generally, a candidate must possess a University degree in Engineering or be a Corporate Member of one of the professional institutions—Mechanical Engineers, Electrical Engineers, or Civil Engineers or have passes in, or exemption from, Sections A or I and B or II of the corresponding Associate Membership examinations. Exceptionally, candidates of high professional attainment, but without the specified qualifications, may be admitted. For some posts Associate Fellowship of the Royal Aeronautical Society or an Honours degree in Physics or Engineering will be accepted.

London salary (Men) £675 (at age 25) to £1,035. Starting salary according to age up to £930 at 34. Candidates entering below age 25 will start at salaries varying from £472 at age 21 to £595 at age 24. Prospects of promotion. Salaries of next higher grades are £1,035/£1,355 and £1,410/£1,575. Somewhat lower in the provinces.

Women's scales lower but being improved under equal pay scheme.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30 Old Burlington St, London, W.1, quoting No. S85/55. Completed applications should be returned as soon as possible and in any case before 31 Dec., 1955. (T 476)

CENTRAL ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 77/55

APPLICATIONS are invited for the superannuable N.J.B. appointment of FOURTH ASSISTANT ENGINEER, Measurement Section, Technical Department at Divisional Headquarters.

Salary: AX/DX 6—£600/£785 per annum.

H.N.C. or equivalent qualification desirable.

The work of this Section involves precision measurements by means of potentiometer equipment, integrating meters, indicating instruments and electronic devices. Additional duties concern the acceptance testing of new generators, efficiency testing of existing plant, the initiation of signals for remote indication and much new development.

Applicants having an interest in such work may obtain application forms from the Secretary, Central Electricity Authority, South Wales Division, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 26 July, 1955. (T 477)

CENTRAL ELECTRICITY AUTHORITY
[North Eastern Division

APPLICATIONS are invited for the appointment of POWER STATION SUPERINTENDENT at Darlington Power Station.

Applicants should have received a thorough technical and practical training, followed by a wide experience in the operation and maintenance of generating plant and have also held a position of responsibility involving the control of technical and administrative staffs. The successful applicant will be expected to reside within a reasonable distance of the Power Station.

The salary for the appointment (which is superannuable) will be in accordance with Scale 1 (£1,250/£1,400) of the Managerial and Higher Executive Grades Committee Salary Scales.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne 1, to whom they should be returned to arrive not later than 22 July, 1955. (T 454)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER (DISTRIBUTION DESIGN)

APPLICANTS should hold at least the Higher National Certificate in Electrical Engineering and have had constructional, operational and maintenance experience on overhead and underground distribution systems.

The successful applicant will be employed on the planning and estimating of all types of development schemes.

Salary—N.J.B. Class M, Grade 13, £755/£15/£800 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 28 July, 1955.

No. 5 (Wakefield) Sub-Area

Castleford District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants should hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 28 July, 1955.

No. 6 (Hull) Sub-Area

Goole District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants should hold the Higher National Certificate in Electrical Engineering, or equivalent qualifications, and have had training in the construction, operation and maintenance of H.V. and L.V. overhead and underground Distribution Systems.

The successful candidate will be required to reside in Goole or the near vicinity.

Salary—N.J.B. Class E, Grade 13, £475/£15/£520 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees should be forwarded to the Manager, No 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 28 July, 1955. (T 500)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation Construction Department at Drakelow Power Station, near Burton-on-Trent. N.J.B. service conditions, superannuable appointments, salaries within Schedule "C," Grade 6 of the Agreement, commencing in range £600/£725 and ultimately rising to £785 per annum.

(*a*) 1 FOURTH ASSISTANT ENGINEER (Mechanical). (Vacancy No. 994MD.)

(*b*) 1 FOURTH ASSISTANT ENGINEER (Electrical). (Vacancy No. 995MD.)

A recognised technical training is required, and preferably possession of the Higher National Certificate, together with a knowledge of the design and installation for (*a*) of mechanical, and for (*b*) of electrical equipment for power stations or similar industrial works.

Apply, quoting the vacancy number on Form AE6, available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham, 13, by 30 July, 1955.

R. L. BATLEY,
Divisional Controller.
(T 506)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (PLANNING)

BOURNEMOUTH District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class G, Grade 9 (£715 x £15—£760 per annum). N.J.B. Conditions of Service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground H.V. and L.V. networks. Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground systems, substation plant and distribution equipment. The possession of suitable technical qualifications will be an advantage. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him in envelopes suitably endorsed not later than 29 July, 1955.

ASSISTANT ENGINEER (GENERAL)

Bournemouth District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class G, Grade 11 (£635 x £15—£680 per annum). N.J.B. Conditions of Service.

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and distribution equipment. The possession of suitable technical qualifications will be an advantage. The successful candidate will mainly be required to assist the Planning Engineer and the appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him in envelopes suitably endorsed not later than 29 July, 1955.

GENERAL ASSISTANT ENGINEER

Newbury District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade 14, commencing at £475 per annum and rising to a maximum of £520. N.J.B. Conditions of Service.

The duties of the post will be to assist with distribution, including minor construction work and general maintenance. Applicants should have received technical training equivalent at least to O.N.C. standard.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him in envelopes suitably endorsed not later than 29 July, 1955.

GENERAL ASSISTANT ENGINEER

No. 2 (Newbury) Sub-Area. Salary N.J.B. Class L, Grade 19 (£475 x £15—£520 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist in the Planning Section mainly in connection with system calculations. Applicants should have received technical training equivalent at least to O.N.C. standard.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him in envelopes suitably endorsed not later than 29 July, 1955.

The successful candidates for the above appointments will be required to contribute to the C.E.A. and Area Boards' Superannuation Scheme, if eligible. (T 499)

EASTERN ELECTRICITY BOARD

INFORMATION OFFICER

127/55R

APPLICATIONS are invited for the appointment of Information Officer in the Secretary's Department at the Board's Head Office at Wherstead, Ipswich.

The principal duties will be concerned with press matters.

Salary will be that for a Principal Assistant on Grade 8 (£960 x £30—£1,080) of the National Joint Council Agreement.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply, by letter, giving the names of two referees, to the Secretary, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk, by 29 July, 1955. (T 478)

LONDON ELECTRICITY BOARD

SENIOR AND ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the following vacancies. These posts are permanent and superannuable and they are graded under Schedule D of the National Joint Board agreement.

ENGINEERING DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 6, £535, 10s./£661, 10s. per annum, inclusive of London Allowance.

South Eastern Sub-Area

DESIGN AND PLANNING BRANCH
(AT WOOLWICH, S.E.18)

Vacancy No. V/1973/T

Applicants should have had a good general and technical education in building construction and architecture, and experience in the design of small buildings in brickwork and reinforced concrete and the drawing up of specifications.

Hampstead/Willesden District

(DESIGN AND PLANNING)

Vacancy No. V/1972/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

North Eastern Sub-Area

(BASED AT STRATFORD, E.15)

Vacancy No. V/1971/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawing; plant layout in substations; layouts and site plans of mains work; electrical diagrams.

St. Marylebone/St. Pancras District

(DESIGN AND PLANNING)

Vacancy No. V/1967/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

Northern Sub-Area

DESIGN AND PLANNING BRANCH
(BASED AT ALDERSGATE ST., E.C.1)

Vacancy No. V/1965/T

Applicants should preferably have had experience in mains recording with a public utility authority, preferably with an Electricity Board, and be able to obtain particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)

Vacancy No. V/1947/T

Candidates must have had a good general and technical education up to National Certificate standard, and must be neat draughtsmen. They should be conversant with the layout of switchgear and transformers and associated equipment up to 11 kV for small substations. They should also be conversant with electrical diagrams, mains records, and similar work. Those with good experience in surveying and planning of mains networks would be considered even if having little experience of substation layouts.

Southern Sub-Area

(BASED AT BECKENHAM, KENT)

Vacancy No. V/1980/T

Candidates should have had a good general and technical education up to Ordinary National Certificate standard, be neat and capable draughtsmen and experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work.

Chief Engineer's Department

(AT STAMFORD ST., S.E.1)

Vacancy No. V/1989/T

Candidates should be experienced in sur-

continued in next column

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veying E.H.V. cable routes and have had good experience in making accurate surveys of cable routes during the laying of E.H.V. cables, taking information and sketches on site and producing final drawings.

Chief Engineer's Department

(AT STAMFORD ST., S.E.1)

Vacancy No. V/1989/T

Applicants, required for plant layout, should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of transforming plant, H.V. switchgear and cables up to 66 kV. (In this instance an appointment may be made within Grade 5, £672/£777 per annum inclusive.)

SENIOR DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 5, £672/£777 per annum, inclusive of London Allowance.

Southern Sub-Area

(BASED AT BECKENHAM, KENT)

Vacancy No. V/1979/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: building and civil engineering design, engineering drawing, plant layout in substations. In addition the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Contracting Section

(AT STRATFORD PLACE, W.1)

Vacancy No. V/1986/T

Applicants should be capable of completing layouts of plant and associated cabling for large industrial installations.

Hampstead/Willesden District

(AT HAMPSTEAD, N.W.3)

Vacancy No. V/1998/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV. In addition, the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

St. Marylebone St. Pancras District

(AT AYBROOK ST, W.1.)

Vacancy No. V/2001/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV. In addition, the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)

Vacancy No. V/1966/T

Candidates must have had a sound general education with technical qualifications equivalent to the Higher National Certificate in electrical engineering. They should have had some workshop training and mechanical experience, and must be conversant with the layout of switchgear and plant up to 11 kV for small substations, including preparation of associated electrical diagrams. A knowledge of building and R.C. structures, whilst not essential, would be an advantage.

Application forms for the foregoing vacancies are obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote reference No. of vacancy preferred.

(T 351)

KENT COUNTY COUNCIL

require an ENGINEERING INSPECTOR with good practical experience in the design and maintenance of electrical and/or heating, hot and cold water and cooking installations in buildings. Salary £600/£725 a year.

Application forms from the County Architect, Springfield, Maidstone.

Closing date: 26 July, 1955. (T 475)

THE NORTH WESTERN ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN, CONSTRUCTION ENGINEER'S SECTION, CHIEF ENGINEER'S DEPARTMENT, AREA BOARD HEADQUARTERS, MANCHESTER

APPLICANTS should have had a good technical training and Drawing Office experience in the electrical design, layout and detailing of indoor and outdoor substations up to and including 33,000 V, together with the preparation of protection system schematic and wiring diagrams.

Preference given to applicants who hold the O.N.C. and/or H.N.C. in Electrical Engineering.

Salary within range: £510 x £20—£630 per annum. Schedule D, Grade 6, N.J.B. Conditions.

Applications to the Establishment Officer, The North Western Electricity Board, Cheetwood Rd, Manchester 8, by 23 July, 1955.

DEMONSTRATOR, OLDHAM DISTRICT

Applicants should be experienced in the Sales promotion and public and home demonstration of all types of electrical domestic appliances, and have obtained the E.A.W. Electrical Housecraft Certificate or other suitable qualification.

Salary Scale: £425/£525 per annum, Grade 1. (Progress beyond £465 per annum subject to Certificate of Capability). N.J.C. Conditions.

FOURTH ASSISTANT ENGINEER (TESTING), SUB-AREA ENGINEER'S DEPARTMENT, STALYBRIDGE

Applicants should have a sound practical knowledge of meter and instrument technology. Experience in the commissioning and maintenance of protective gear is also desirable. Preference given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £675 x £15—£720 per annum. Grade K.13. N.J.B. Conditions.

Applicants for the above-mentioned posts to Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union St, Oldham, by 23 July, 1955.

ENGINEERING DRAUGHTSMAN, (SURVEYORS), BARROW, KENDAL, WHITEHAVEN, WORKINGTON, PENRITH AND CARLISLE DISTRICTS

Duties will primarily consist of field survey, and the subsequent profiling of overhead line routes. Successful applicants will be afforded the opportunity of gaining mains experience.

Salary Scale: £510 x £20—£630 per annum. Schedule D, Grade 6. N.J.B. Conditions.

ENGINEERING DRAUGHTSMAN, BARROW DISTRICT

Applicants should have had a good general distribution Drawing Office experience and should be capable of preparing schematic diagrams, profiles, working drawings for rural schemes, and maintenance of records. A knowledge of mechanical engineering would be an advantage.

Salary Scale: £510 x £20—£630 per annum. Schedule D, Grade 6. N.J.B. Conditions.

GENERAL ASSISTANT DISTRICT ENGINEER, KENDAL DISTRICT

Applicants must have had a sound practical training and experience in construction operation and maintenance of O/H and U/G distribution networks, and associated equipment. Preference given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £475 x £15—£520 per annum, Grade D.12. N.J.B. Conditions.

Applications for the above-mentioned posts to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by 23 July, 1955. (T 490)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT (Technical) required in the Warrington District. Salary £595/£640 per annum (N.J.B. F/11).

Applicants should have had engineering training and possess a Higher National Certificate in Electrical Engineering or other similar qualifications.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, near Northwich, Cheshire. Closing date: 25 July, 1955. (T 467)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY
(INDUSTRIAL GROUP)

requires for

THE FIRST OF BRITAIN'S NUCLEAR POWER STATIONS

Sited at Calder Hall in Cumberland,

FIVE ENGINEERS

to control novel plant on a continuous shift system. Candidate should be over 25 years of age, have an Engineering degree or Corporate Membership of a Senior Engineering Institution and have had POWER PLANT experience. Ample opportunity will be given for training so that during silent hours, full responsibility can be taken. (Reference No. 1,004.)

AN ELECTRICAL ENGINEER

is also required to assist the Works Engineer with maintenance. His main responsibility will be to supervise the electrical and instrument installations. Candidates should have served a recognised engineering apprenticeship and have Corporate Membership of the Institution of Electrical Engineers or equivalent qualifications and should have had appropriate experience. (Reference No. 1,005.)

SALARY

for all posts will be assessed on the scale £1,065/£1,370 per annum. Additional allowances are payable for shift duties. All new entrants under the age of 55 automatically join the Authority's Pension Scheme. Houses will be available within a reasonable period for successful married candidates. Send a postcard for application form to:

SENIOR RECRUITMENT OFFICER

U.K.A.E.A.

INDUSTRIAL GROUP HEADQUARTERS
RISLEY · WARRINGTON · LANCS

Quoting the appropriate reference number (T 493)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation Construction Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule "C" of the Agreement:

(*a*) 1 THIRD ASSISTANT ENGINEER (Electrical) at Rugeley Power Station, Staffs, Grade 4, commencing in range £750/£875 and ultimately rising to £950 per annum. (Vacancy No. 996MD.)

(*b*) 1 FOURTH ASSISTANT ENGINEER (Electrical) at Hams Hall "C" Power Station, near Birmingham, Grade 6, commencing in range £600/£725 and ultimately rising to £785 per annum. (Vacancy No. 997MD.)

Applicants should have received a sound training in electrical engineering and for (*a*) a knowledge of power station construction. They should be capable of supervising and co-ordinating site erection works, particularly H.T. switchgear. For (*b*) applicants should have experience of the design and installation of electrical equipment for power stations, or similar industrial works. Appropriate qualifications an advantage.

Apply, quoting the vacancy number on Form AE6, available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham, 13, by 30 July, 1955.

R. L. BATLEY,
Divisional Controller.
(T 505)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Mechanical) is required at Stourport "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K8, £900/£975 per annum.

A sound technical training and practical experience in modern power station mechanical maintenance is required, and the possession of appropriate technical qualifications will be an advantage.

Apply, quoting vacancy No. 991MD, on Form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 30 July, 1955.

R. L. BATLEY,
Divisional Controller.
(T 482)

EAST ANGLIAN REGIONAL HOSPITAL BOARD

(1) SENIOR ASSISTANT ENGINEER (Mechanical)—Candidates to be experienced in design and installation of heating, ventilating, steam boiler plant and services, etc., and must be A.M.I.MECH.E., or equivalent. Salary £900 x £30—£1,050 per annum.

(2) ASSISTANT ENGINEER (Mechanical)—Candidates to be experienced in the work at (1) and should be A.M.I.H.V.E. or Graduate Members of the I.H.V.E. or equivalent. Salary £625/£890 per annum.

(3) ASSISTANT ENGINEER (Electrical)—Candidates to be experienced in design and installation of electrical engineering services and should be A.M.I.E.E., or Graduate Members of I.E. or equivalent. Salary £625/£890 per annum.

(4) ENGINEERING ASSISTANTS—Candidates to be experienced in work described above and possess Ordinary National Certificate (Mechanical or Electrical). Salary £465 (at age 21 or over)—£650 per annum.

(5) DRAUGHTSMEN (Engineering)—Candidates to have had suitable training and experience. Salary £380 (at age 21 or over)—£570 per annum.

Additional increments within the scale based on experience and age may be granted in respect of posts (2) and (3). Commencing salary for post (4) may be fixed at point above minimum, but will not exceed £550 per annum. The above salary scales are at present under review.

Applications indicating appropriate post and stating age, qualifications, experience and details of present position with names of three referees to Secretary of Board, 117 Chesterton Rd, Cambridge, by 2 Aug., 1955. (T 491)

NATIONAL COAL BOARD
North Western Division

APPLICATIONS are invited for post of TECHNICAL ASSISTANT to Divisional Chief Electrical Engineer. Duties include investigation of special problems, preparation of specifications and calculations including those involved in design of electric winders. Previous colliery experience an advantage; technical training to at least H.N.C. (Elec. Eng.) essential. Salary according to qualifications and experience, within range £850/£1,350 per annum. Applications giving age, qualifications and experience to Establishments Officer, 40 Portland St, Manchester, by 30 July. (T 468)

CENTRAL ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following post:

STATION SHIFT CONTROL/BOILER SHIFT CONTROL ENGINEER, PETERBOROUGH GENERATING STATION

Salary Class F, Grade 10, £635 x £15—£680 per annum.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering, or its equivalent, have experience in the operation of a Switchboard at a Generating Station and be fully conversant with High Voltage Switching operations and protective systems. Applicants should, in addition, have had experience in the operation of pulverised fuel fired steam raising plant.

The applicant appointed will be required to interchange the duties of Station Shift Control Engineer and Boiler Shift Control Engineer.

Applications, stating age, details of experience and qualifications should be sent to the Controller, Central Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than 23 July, 1955.

W. N. C. CLINCH,
Controller.
(T 484)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

A FOURTH ASSISTANT ENGINEER is required in the Divisional Testing Department. N.J.B. service conditions, superannuable appointment, commencing salary within Schedule C, Grade 6, £600/£725 per annum, rising ultimately to £785 per annum.

Applicants should hold the Ordinary National Certificate, preferably in Mechanical Engineering, and should have some knowledge of power station plant testing.

Apply, quoting vacancy No. 990MD, on Form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 30 July, 1955.

R. L. BATLEY,
Divisional Controller.
(T 481)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

DEPUTY POWER STATION SUPERINTENDENT
LINCOLN POWER STATION
Vacancy No. 106/55/ET

Candidates should have a wide experience in the operation, maintenance and administration of an Electricity Generating Station.

Corporate Membership of the Institution of Electrical Engineers or the Institution of Mechanical Engineers will be an advantage.

Salary will be in accordance with Class E, Grade 3 (£900 x £25—£975 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 July, 1955.

SECOND ASSISTANT ENGINEER
(ELECTRICAL) GENERATION (CONSTRUCTION) DEPARTMENT
Vacancy No. 110/55/ET

Preference will be given to applicants who hold a degree in Electrical Engineering, are Corporate Members of the Institution of Electrical Engineers, or possess other equivalent qualifications.

They should have had experience in the design and installation of switchgear, transformers and cables up to 33 kV and other electrical equipment associated with modern power station.

Experience in the preparation of specifications and estimates and preparing reports on tenders will be a recommendation.

Salary will be within Schedule C, Class AX/DX, Grade 2 (£950/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 July, 1955.

SHIFT CONTROL ENGINEERS
STAYTHORPE POWER STATION
Vacancy No. 107/55/ET

Applicants should have had a sound training and practical experience in a modern power station. The possession of a

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Higher National Certificate in Electrical Engineering or its equivalent, would be advantageous.

The salary will be in accordance with Class J, Grade 10 (£755 x £15—£800 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 July, 1955.

GENERAL ASSISTANT ENGINEERS
STAYTHORPE POWER STATION
Vacancy No. 108/55/ET

General Assistant Engineers are required at Staythorpe Power Station where suitable young engineers will be given opportunity to obtain operating and maintenance experience in the various sections of this large Generating Station operating at 900°/900 lb sq in. steam conditions.

Preference will be given to candidates who hold the Higher National Certificate, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class J, Grade 16 (£515 x £15—£560 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 July, 1955.

GENERAL ASSISTANT ENGINEER
LEICESTER POWER STATION
Vacancy No. 114/55/ET

Duties will be in the Boiler House and Control Room. Qualifications up to Higher National Certificate standard would be an advantage.

Salary will be in accordance with Class H, Grade 16 (£475 x £15—£520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Aug., 1955.

SECOND ASSISTANT ENGINEER (CIVIL)
STAYTHORPE "B" POWER STATION
Vacancy No. 116/55/ET

The successful applicant will be required to assist in supervising the civil engineering and building work at Staythorpe "B" Power Station in collaboration with the Consulting Engineers.

Preference will be given to applicants who have a degree in Civil Engineering, are Corporate Members of the Institution of Civil Engineers or possess equivalent qualifications. They should have had experience in the administration of large Civil Engineering contracts, and be able to supervise the setting out and progress of the works, which include heavy pile foundations, culverts, structural steelwork, buildings and the like.

Salary will be in accordance with Class AX/DX, Grade 2 (£950/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Aug., 1955.

FOURTH ASSISTANT ENGINEER
(MECHANICAL)
NORTH WILFORD POWER STATION
Vacancy No. 115/55/ET

The successful applicant will be required to assist in supervising the installation of Generating Plant at North Wilford Power Station.

Applicants should have had a fundamental training in mechanical engineering, including workshops, and should preferably have had experience in the manufacture, erection, maintenance and operation of mechanical plant as installed in modern Power Stations. Preference will be given to candidates who possess a degree or are Graduate Members of the Institution of Mechanical Engineers.

Salary will be in accordance with Class AX/DX, Grade 6 (£600/£785 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 4 Aug., 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
8 July, 1955. (T 501)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

FOURTH ASSISTANT ENGINEER
(i) SOUTHEND DISTRICT, ESSEX SUB-AREA 128/55.R
(ii) EDMONTON DISTRICT, NORTHMET SUB-AREA 129/55.R

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary—N.J.B. Class F, Grade 11 (£595/£640) plus London allowance for the appointment at Edmonton.

Apply by letter within 14 days, to the District Manager, Eastern Electricity Board, at the following addresses:

(i) 85 London Rd, Southend-on-Sea, Essex.
(ii) 305 Fore St, Edmonton, London, N.9.

Suffolk Sub-Area

Sub-Area Headquarters, Stowmarket
(a) ENGINEERING DRAUGHTSMAN 131/55.N
(b) TWO 4TH ASSISTANT ENGINEERS (P & D) 130/55.N

For appointment (*a*) candidates should preferably have a sound knowledge of applied mechanics and a good working knowledge of electrical engineering practice would be an advantage. The successful candidate will be required to assist in the design of poles and structures and in the preparation of specifications for overhead lines up to 33 kV.

The duties of appointment (*b*) are mainly planning and candidates should have had a sound technical training and preferably some experience in the design, layout and operation of urban and rural distribution systems at voltages up to 33 kV. Candidates should have obtained the Higher National Certificate in Electrical Engineering or its equivalent.

Salary—(*a*) N.J.B. Schedule D, Grade 6 (£510/£630).
(*b*) N.J.B. Class J, Grade 13 (£635/£680).

Apply for both appointments by letter within 14 days, to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, Suffolk.

CLACTON DISTRICT
FIRST ASSISTANT DISTRICT ENGINEER 132/55.R

Candidates should have had a sound technical training and wide experience in the planning, construction, operation and maintenance of overhead and underground systems (including substations) up to and including 33,000 V in a predominantly rural area.

Salary—N.J.B. Class E, Grade 5 (£790/£850).

Apply by letter within 14 days, to the District Manager, Eastern Electricity Board, 36/38 Station Rd, Clacton, Essex. (T 518)

SOUTH WALES ELECTRICITY BOARD

VACANCIES FOR GENERAL ASSISTANT ENGINEERS

VACANCIES are available at:
Tenby, Carmarthen, and districts in Western Sub-Area;
Pontypool, Newport and districts in Eastern Sub-Area;
Swansea, Llanelly and districts in West Central Sub-Area.

Salary will be in accordance with the National Joint Board Schedule for the Electricity Supply Industry, minimum starting salary £475 per annum. Superannuation and Sick Pay Schemes are in operation.

Qualifications — Ordinary or Higher National Electrical or Mechanical Engineering.

Applications stating age, present position and salary, qualifications and experience should be addressed to the Secretary (Establishments), St. Mellons, so as to reach him not later than Saturday, 23 July, 1955.

D. G. DODDS,
St. Mellons, Secretary.
Cardiff. (T 504)

SOUTH EASTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER (CONSTRUCTION)

Surrey Sub-Area Headquarters, Dorking

SALARY £790/£850 per annum under N.J.B. Class K, Grade 10. Superannuable.

Applicants of at least H.N.C. standard should have experience in assisting in the survey and construction of 33 kV overhead and underground transmission lines and major substations, both outdoor and indoor.

THIRD ASSISTANT ENGINEER (OPERATION AND MAINTENANCE)

Surrey Sub-Area Headquarters, Dorking

Salary £790/£850 per annum under N.J.B. Class K, Grade 10. Superannuable.

Applicants of at least H.N.C. standard should have had a sound distribution experience, including 33 kV networks and substations. The duties will comprise assisting in the commissioning, operation and maintenance of the sub-area 33 kV transmission network and substations and will include system protection testing.

FOURTH ASSISTANT ENGINEER

Surrey Sub-Area Headquarters, Dorking

Salary £675/£720 per annum under N.J.B. Class K, Grade 13. Superannuable.

Applicants of at least H.N.C. standard should have experience in, and an aptitude for, technical calculations as applied to distribution networks. Duties will include assisting in carrying out calculations in system design, load flows, fault power levels, system protection and the like.

GENERAL ASSISTANT ENGINEER (OPERATION AND MAINTENANCE)

Surrey Sub-Area Headquarters, Dorking

Salary £515/£560 per annum under N.J.B. Class K, Grade 17. Superannuable.

Applicants of at least H.N.C. standard should have had a sound training in electrical distribution. Experience of maintenance of 33 kV equipment and a knowledge of system protection will be an advantage.

Applications for these 4 appointments should be made on forms from C. W. Hughes, B.SC., M.I.E.E., Surrey Manager, SEEBoard, Rough Rew, Horsham Rd, Dorking, Surrey, which should be returned by 27 July, 1955.

THIRD ASSISTANT DISTRICT ENGINEER Weald District

Salary £595/£640 per annum under N.J.B. Class D, Grade 9. Superannuable.

Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead systems up to 33 kV.

Applications, naming 2 referees, to W. J. Collins, A.M.I.E.E., District Manager, SEEBoard, Highgate, Hawkhurst, Kent, by 27 July, 1955.

A. L. BURNELL, Secretary. (T 503)

CENTRAL ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with the N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

STATION SHIFT CONTROL ENGINEER ST. MARYLEBONE GENERATING STATION Vacancy No. 55/528

Practical experience in Control Room Operation necessary.

Salary: Class E, Grade 10, £624. 15s. per annum.

(*Applicants to Vacancy* 55/417 *will be considered and need not re-apply.*)

ASSISTANT SHIFT CHARGE ENGINEER ST. MARYLEBONE GENERATING STATION Vacancy No. 55/529

Sound technical training necessary with practical experience in Generating Station operation.

Salary: Class E, Grade 9, £666. 15s. per annum.

ASSISTANT SHIFT CHARGE ENGINEER HACKNEY GENERATING STATION Vacancy No. 55/530

Experience necessary on modern boiler

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and turbine plant, P.F. and Stoker fired boilers, and E.H.T. Switchgear.

Salary: Class H, Grade 9, £792. 15s. per annum.

FOURTH ASSISTANT ENGINEER (EFFICIENCY AND TESTING) DIVISIONAL H.Q. Vacancy No. 55/531

Candidates should have a good technical education and experience of the testing of mechanical plant in a Power Station.

Salary in accordance with Schedule C, of the N.J.B. Agreement, Grade 5, £708. 15s./£924 per annum.

ASSISTANT ENGINEER (ELECTRICAL) BARKING "A" AND "B" GENERATING STATION Vacancy No. 55/532

Applicants should have had previous experience of electrical maintenance. Drawing Office experience would be an added advantage.

Salary: Class L, Grade 16, £624. 15s. per annum.

GENERAL ASSISTANT ENGINEER, TECHNICAL DEPARTMENT DIVISIONAL H.Q. Vacancy No. 55/533

Candidates should have good technical qualifications or good practical experience in installation and maintenance of telecommunication equipment. Works training in this field will be considered an advantage.

Salary: AX/EX Grade 7, £500/£661. 10s. per annum.

Applications, quoting vacancy number, may be made on form A.E.6/ACT obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (T 483)

SURREY EDUCATION COMMITTEE
Kingston Technical College, Fassett Road, Kingston-upon-Thames

required in September, LECTURER in Electrical Engineering. Candidates should have a degree in Engineering or equivalent qualifications, together with teaching and/or industrial experience, and will be expected to lecture in the subjects of Principles and Design of Electrical Machines and/or Electrical Power and Electrical Measuring Instruments in the full-time Degree and Diploma Courses.

Salary scale (men) £965 x £25—£1,065, plus London Allowance.

Further particulars and form of application obtainable on receipt of stamped, addressed envelope from the Principal to whom the completed form should be returned not later than two weeks after the appearance of this advertisement. (T 522)

ASSISTANT ENGINEER
Electrical

required for their London Office by the Crown Agents for Oversea Governments and Administrations. Basic salary scale £650 x £25—£750 x £30—£960 x £40—£1,000 plus Extra Duty Allowance of approximately 8% and a Pay Supplement of from £25 to £35 a year. The £650 minimum is linked to entry at age 25 and is subject to increase at the rate of one increment for each year above that age up to 34. Fully-qualified officers at least 27 years old may be eligible for a special increase of £75 after two years' service. Engagement on unestablished terms with prospect of appointment to the established staff after five years' service and of promotion. Candidates should be between 25 and 35 years of age and have a degree in electrical engineering or be a Graduate or Corporate Member of the Institution of Electrical Engineers. They should have served an apprenticeship or pupilage with an established electrical manufacturer, contractor or undertaking, and have had subsequent operating or design experience in either medium-sized thermal power stations, transmission and distribution systems or consumers installations. Previous contract experience would be an advantage. The duties of the post will entail the purchase of all types of electrical plant and equipment, including the preparation of detailed specifications to enable tenders to be invited and adjudication thereon. Also the preparation of reports giving advice to Administrations

continued in next column

continued from previous column

on problems connected with all types of electrical plant. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/40773/EE. (T 466)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Dumfries and Galloway Area

DISTRICT COMMERCIAL ENGINEER, ANNAN DISTRICT

APPLICATIONS are invited for the appointment of a District Commercial Engineer in the Annan District of the Area. Salary and conditions in accordance with the National Joint Board Agreement, Class D, Grade 3, £840/£900 per annum.

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications and have experience in the utilisation of electrical energy in Industrial, Commercial, Domestic and Agricultural premises, a knowledge of installation work and be conversant with Tariffs, Sales and all aspects of service to consumers.

The position is superannuable. Applications should be made on the standard application form which may be obtained from the undersigned and should be returned not later than Monday, 1 Aug., 1955.

W. H. WILLS, Manager.
Marchmount, Dumfries. (T 486)

A SKILLED ELECTRICAL FITTER/ARMATURE WINDER for assembly of wide range of electric motors, etc. Must have repair shop experience. Excellent prospects, Lewis Electric Motors Ltd., Moor Works, Maidenhead, Berks. (T 437)

ASSISTANT to Export Manager, age 30/40, required by manufacturers of specialist electrical control gear with works 20 miles west of London. Higher National Certificate or equivalent. Ability to handle technical and commercial correspondence and small staff. Good prospects and pension scheme. Commencing salary £850 per annum.—Box No. 4597, Electrical Times. (T 193)

A NUMBER of vacancies exist for CONSTRUCTION ENGINEERS, Assistants and Surveyors for Overhead Line Work throughout Scotland. Good prospects for suitable men. In certain cases experience in Substation construction would be an advantage but is not essential. Give full details, training, experience, age, etc., to Box No. 786, Keith and Co., Advertising Agents, 137 Princes St, Edinburgh. (T 497)

AN ENGINEER and a DRAUGHTSMAN are required by Consulting Engineers in Westminster for interesting and varied work. Good prospects for suitable applicants. Reply to—Box No. 4671, Electrical Times. (T 508)

FERRANTI LTD.

have a vacancy for a SENIOR DESIGNER of LARGE POWER TRANSFORMERS.

The successful candidate, who should preferably be under 40 years of age, would be appointed to the senior staff of this important transformer manufacturer and would have ample opportunity for the exercise of initiative and for independent work. The post carries an excellent starting salary.

The Company would be prepared to assist with the cost of removal. A Staff Pension Scheme is in operation.

Application forms from Mr T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs.

Please quote reference TSD.

(T 439p)

SOUTH AFRICA

Engineers and Draughtsmen for Switchgear

For their Switchgear Plant in Johannesburg, South Africa, Johnson and Phillips Ltd. require experienced Engineers and Draughtsmen.

Engineers are wanted for project sales, for technical sales and for the preparation of tenders and contract work.

Draughtsmen are required for the preparation of diagrams, layout work or switchgear design.

Good opportunities exist for gaining experience and promotion. Apply, giving full particulars of training, to:

Employment Manager,
Johnson and Phillips Ltd.,
Charlton, London, S.E.7.

(T 474p)

BRUSH ELECTRICAL ENGINEERING CO., LTD., require a DEVELOPMENT ENGINEER for their Cardiff Works. The Applicant should have reached the H.N.C. standard and served a suitable apprenticeship in Electrical Engineering. Subsequent experience in a Design Office or Development Laboratory is necessary and first consideration will be given to men possessing some experience of problems of circuit interruption. The candidate should possess a positive approach to problems and should be capable of deducing practical solutions from work involving theoretical and experimental approach. Replies to Personnel Officer, Hopkinson Works, Birchgrove, Cardiff. (T 449)

BUYER. Experienced Buyer required for a cable company in the London area. An excellent opportunity for an experienced man over 30 years of age capable of dealing with raw materials and extensive engineering supplies. Applicants should state full details of previous experience. The post will be permanent and pensionable, with good prospects.—Box No. 4647, Electrical Times. (T 403)

BRUSH ELECTRICAL ENGINEERING CO., LTD., require a FUSE GEAR ENGINEER for their Cardiff Works. The Applicant should possess H.N.C. or a Degree in Electrical Engineering and his experience should include an apprenticeship in Electrical Engineering. Subsequent experience in the design of H.R.C.F. uses is necessary and it is important that the candidate possesses a flair for original design. The post is a senior one and carries some administrative responsibility. Replies to Personnel Officer, Hopkinson Works, Birchgrove, Cardiff. (T 448)

CAPABLE A.C. MOTOR REWINDER required for all sizes of motors in Midlands repair and maintenance workshop.—Box No. 4669, Electrical Times. (T 489)

PREECE, CARDEW AND RIDER, Consulting Engineers, require senior and junior ENGINEERS and DRAUGHTSMEN for design and other work connected with new modern power stations and transmission systems.

Prospects and salary will be good for men with a capacity for work and able to accept responsibility.

Superannuation and bonus schemes.

Five-day week.

Applicants with good technical qualifications and training should apply giving full details to: 8, 10 and 12 Queen Anne's Gate, London, S.W.1. (T 496)

CONTRACTS ENGINEER required by Cable Maker with headquarters in London. Applicants should preferably have Ordinary National Certificate and must have had good experience in the installation of all types of power cables. A knowledge of overhead line construction would be an advantage. Apply—Box No. 4661, Electrical Times. (T 479)

CENTRAL ELECTRICITY AUTHORITY Bankside House, London, require:

SENIOR MECHANICAL ENGINEERING DRAUGHTSMAN, Grade 4, with experience on the layout of Generating Stations.

CIVIL ENGINEERING DRAUGHTSMAN, Grade 6, for reinforced concrete details and layout of foundations.

ELECTRICAL DRAUGHTSMAN, Grade 6.

Salaries: N.J.B. inclusive of London Allowance: Grade 4, £788/£893 per annum. Grade 6, £536/£662, according to experience and ability. Pension Scheme. One Saturday morning in four on Duty. Application forms from Director of Establishments, Winsley St, W.1. Quote Ref.: AE/621. (T 523)

CENTRAL ELECTRICITY AUTHORITY require a WARDEN and TUTOR at their Residential Training Establishment, Horsley Towers, near Guildford, Surrey. This centre provides short courses on industrial relations, foremanship, management and technical subjects for employees of the electrical supply industry.

The Warden and Tutor is responsible to the Authority's Education and Training Officer for conducting courses and for administrative discipline at the Establishment.

A Separate House Manager is employed. Applicants should have had administrative experience and experience of contemporary techniques in industrial training including group discussions, projects, case studies and syndicate working. The post, which is superannuable, carries a provisional salary of £1,250 x £50—£1,400 per annum, together with unfurnished accommodation suitable for a married man with family. It is hoped that the person appointed will take up duty not later than 1 Oct. Applications, stating age and giving full details of experience to D. Moffat, Director of Establishments, Winsley St, W.1, by 5 Aug., 1955. Quote Ref.: AE/642. (T 521)

CENTRAL ELECTRICITY AUTHORITY require an ASSISTANT in the Commercial Department, Bankside House, London. The duties, which provide scope for enterprise and initiative, are concerned with Tariffs and the commercial development of the Electricity Supply Industry, and extend from generation to utilisation. Candidates should be capable of undertaking studies of wide general interest to the Industry and preference will be given to those who have some experience in the electricity supply industry and in economic investigation. An educational qualification up to graduate standard in Engineering or Economics would be an advantage. Salary N.J.B. Grade 5 (£500/£683) inclusive, according to qualifications and experience. Applications stating age, present position and salary and giving full details of qualifications and experience to D. Moffat, Director of Establishments, Winsley St, W.1, by 25 July, quote ref.: AE/619. (T 469)

DESIGN ENGINEER for Power Rectifiers is required by a large Manufacturing Organisation in the Midlands, for work of exceptional technical interest and good prospects. No previous rectifier experience is necessary, but candidates should have degree or good H.N.C, and some practical training. Excellent residential and educational district. Please write with full details to Box No. A41, T. and G., 167 High Holborn, London, W.C.1. (T 389)

DRAUGHTSMAN required for general work in electrical laboratories in Shepherds Bush area. Previous experience in the electrical industry is not essential. Pension Fund. Five-day week. Apply in writing, quoting reference L/1/55 to—Box No. 4665, Electrical Times. (T 487)

JOHNSON & PHILLIPS LIMITED

WORKS MANAGER FOR PAKISTAN

APPLICATIONS are invited for the post of Works Manager for the Company's Switchgear Factory in Pakistan. The successful applicant will be required to take technical and administrative charge of the factory, which manufactures and assembles switchgear up to 11,000 V.

Applicants should have had sound technical and practical experience of the manufacture and application of L.V. and H.V. switchgear.

The factory is situated a few miles out of Karachi and is housed in modern buildings which have recently been extended.

The appointment will be a senior permanent one. Generous salaries with good U.K. leave and other conditions of employment will be offered to suitable applicants.

Candidates should preferably be not more than 35 years of age.

Applications (which will be treated in strict confidence) should be as complete as possible and should be addressed to:

The Managing Director,
Johnson & Phillips Limited,
Charlton, London, S.E.7.

(T 512p)

DESIGNER/DRAUGHTSMEN. Crompton Parkinson Ltd., Doncaster, have vacancies for Designer/Draughtsmen for the mechanical development of F.H.P. motors. These positions offer splendid opportunity for men with ability and a generous salary is envisaged. There is ample scope for advancement within the organisation and the Company operates a Superannuation Fund to which employees contribute when eligible. Apply to Personnel Officer, giving details of qualifications, experience and age. (T 401)

DEVELOPMENT ENGINEER required for work in the laboratories of a large electrical company in Shepherds Bush area. Drawing office experience is desirable. General interests and adaptability rather than academic qualifications are required. Pension Fund. Five-day week. Apply in writing, quoting reference L/2/55 to—Box No. 4667, Electrical Times. (T 488)

DESIGNER required with experience of Distribution and Medium Power Transformers up to 5,000 kVA, 33 kV or over. Permanent and progressive position. Salary commensurate with experience and qualifications. Apply, in confidence to, Chief Engineer, Transformers (Watford) Ltd., Sandown Rd, Watford, Herts. (T 470)

DRAUGHTSMEN required Electro-Mechanical work of varied nature, knowledge of circuitry an advantage but not essential. Salary in accordance with age and experience. Pension scheme. Write giving details of experience etc., quoting (Ref.: STK 29), The General Electric Co., Ltd., Union Works, East Lane, Wembley. (T 515)

DRAUGHTSMAN with some experience of electrical and light engineering required for a small works in London, S.W.1. Interesting job; good opportunity for enterprising man. State age, experience and salary required.—Box No. 4641, Electrical Times. (T 390)

DRAUGHTSMAN required for preparation of Wood Pole Line Drawings. High Rates paid. Permanency if suitable. Apply in writing in first instance to B. French Limited, Pike Mills, Green St, Kidderminster. (T 451)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

JOHNSON & PHILLIPS LIMITED
CONTRACT MANAGER FOR PAKISTAN

APPLICATIONS are invited for the post of Contract Manager to take charge of the installation, contract and construction activities of the Company's Pakistan Organisation. Applicants should have had sound commercial and technical experience in the planning, tendering for, and supervision on site of industrial and other electrification schemes.

The Company's branch premises are situated a few miles out of Karachi and are housed in modern buildings which have recently been extended.

The appointment will be a senior permanent one. Generous salaries with good U.K. leave and other conditions of employment will be offered to suitable applicants.

Candidates should preferably be not more than 35 years of age.

Applications (which will be treated in strict confidence) should be as complete as possible and should be addressed to:

The Managing Director,
Johnson & Phillips Limited,
Charlton, London, S.E.7.
(T 513p)

DRAUGHTSMEN. First-class structural draughtsmen required at top rates. Five-day week, Pension Fund, permanent position with good prospects. Apply in writing giving full particulars to Staff Officer, B.I.C.C. Co., Ltd., 30 Leicester Sq, London, W.C.2, quoting reference C/2/55. (T 457)

DRAUGHTSMEN for Low Voltage Electrical Distribution Equipment including Joint Boxes and Terminations. 5-day week. Pension Fund. Apply in writing, stating age, details of experience and salary expected, to the Personnel Officer, W. T. Henley's Telegraph Works Co., Ltd., Gravesend. (T 458)

ELECTRICAL Contractors 30 miles north of London require GENERAL FOREMAN. Applicants must have wide experience in industrial installation practice and experience of control of labour.—Box No. 4663, Electrical Times. (T 480)

EXPERIENCED YOUNG ENGINEERS and commercial men required for a progressive cable works in the London area. Age about 30 with good industrial experience and personality. Specialised training will be given to fit applicants for responsible positions. There is a pension scheme and good prospects. Applicants should state qualifications and experience.—Box No. 4649, Electrical Times. (T 404)

ESTIMATING ENGINEERS required having a good electrical engineering background with a knowledge of excavation and concrete work. Experience of contract conditions and the preparation of schedules, variations, etc., is desirable. The work relates to Cathodic protection of piping, steelwork, tankage, etc. The posts are progressive and the successful applicants would be required to deal with the management of small contracts and the sales aspect of Cathodic protection equipment. Non-contributory pension scheme and luncheon vouchers. Applications stating full details of previous experience (quoting B.5012) should be sent to the Personnel Manager, Costain-John Brown Ltd., 40 South St, London, W.1. (T 519)

ESTIMATING STAFF required, Male or Female. Write stating age, experience and salary required to the Cable Makers Association, 52/54 High Holborn, London, W.C.1. (T 520)

ELECTRICAL ENGINEERING DRAUGHTSMEN required by a firm of Engineers and Contractors on Tees-side for complete electrical installation, design, including motor application, control scheme engineering, distribution and cabling. Experience of contract work and estimating an advantage. Apply stating age, experience and salary required, quoting reference "W," to —Box No. 4609, Electrical Times. (T 281)

JUNIOR SALES REPRESENTATIVE required by a leading electrical engineering company in London. Preference given to applicants with some electrical knowledge and a flair for selling. Write with full details of age, experience and salary required to Box No. 8892, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (T 455)

LIGHTING FITTINGS. DESIGNER/DRAUGHTSMAN required for very interesting work on the design of fluorescent lighting fittings. Experience on lighting equipment or other sheet metalwork desirable. Ideas and ability to translate them into production practice are more important than extreme competence in mechanical draughtsmanship. Excellent prospects for a bright, intelligent man. Superannuation Scheme. Apply to Personnel Officer, Crompton Parkinson Ltd., Doncaster, Yorks. (T 400)

MULLARD LIMITED. An opportunity occurs for an ENGINEER, 25-30 years of age, to enter an expanding commercial engineering office handling magnetic materials and electrical and radio components. The post would suit a man educated to GRAD.I.E.E. standard with good technical background who wishes to enter the commercial side of engineering. Starting salary will be not less than £620 per annum with full employee benefits and scope for advancement in an expanding field. Applications in writing should be addressed to the Personnel Officer, Century House, Shaftesbury Ave, London, W.C.2. (T 511)

POWER CABLE ENGINEERS required with experience of all types of cable installation work including overhead power lines; a knowledge of railway electrification would be an advantage. The appointments will be for contract work either at home or overseas. Position permanent with contributory pension scheme. State age, qualifications, experience and salary required. London area.—Box No. 4673, Electrical Times. (T 509)

REPRESENTATIVE required by leading electrical manufacturers to cover the Home Counties. Preference given to applicants having contacts in industry. Write giving age, experience and salary required, to Box No. 8893, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (T 456)

REQUIRED by Foster Wheeler Ltd., for work in the Middle East:
ELECTRICIAN / CABLE JOINTER. Must be capable of laying, cutting, jointing and sealing all types of heavy industrial armoured multi-core electrical cables to carry currents from 440 V up to 11,000 V A.C. Must have had several years' experience in this type of work.

Contract is in Bahrain Island, Persian Gulf, for up to 24 months duration. Good salaries paid plus overtime, bonus and leave pay, free accommodation in air-conditioned bachelor quarters with allowance which amply covers all cost of feeding. Kit allowance of £50 before departure.

Apply in writing only, stating age and experience, to: Foster Wheeler Ltd., 3 Ixworth Place, London, S.W.3. (T 413)

SWITCHGEAR SALES ENGINEER required for London Area Office of well-known manufacturer. Age 24-28, must have experience in contactor gear and circuit-breaker gear. Contract or Installation experience also an advantage. Write with full details of experience and technical qualifications to: M. and C. Switchgear Ltd., 36 Victoria St, Westminster, S.W.1. (T 495)

ELECTRICAL ENGINEERS

The Associated Ethyl Company Limited wish to appoint two Graduate Engineers to the electrical section of Engineering Department at Ellesmere Port.

Opportunity is available for work in the following fields:

Design, construction and commissioning of large H.V. and L.V. industrial systems, including electrochemical installations.

Design of electric circuits associated with process control.

Experience in administration, planning and control of electrical design work, specifications and standards will be an advantage.

The Department is expanding and to the candidate whose qualifications and personality indicate ability to progress, an attractive salary and considerable prospects are possible.

Applications stating age, qualifications and experience, should be addressed to the Deputy Manager—Personnel, The Associated Ethyl Company Limited, Ellesmere Port, Cheshire. (T 514p)

SALES MANAGER, age 35/40, with electrical training and knowledge of cables, capable of controlling sales office and records, outside staff and liaison with works. Good salary and excellent prospects. Apply —Box No. 4653, Electrical Times. (T 452)

SALES MANAGER, age 35/40, good organiser, with electrical training and knowledge of cables, capable of controlling inside and outside sales staff and records, and liaison with works. Good salary and excellent prospects. Apply—Box No. 4657, Electrical Times. (T 472)

SKILLED OVERHEAD LINESMEN required for Wood Pole Distribution Scheme in Inverness Area. Good pay and conditions. Apply by letter to B. French Limited, Pike Mills, Green St, Kidderminster (T 438)

SURVEYOR required, conversant with Surveying and Profiling of Overhead Line Routes. Good Salary and Subsistence. References required. Apply: B. French Limited, Pike Mills, Kidderminster, or 35 Haugh Rd, Inverness. (T 382)

THE BRITISH OXYGEN CO., LTD., require an ELECTRICAL INSPECTING ENGINEER. Duties involve testing and inspection of electrical installations in various works of the Company situated throughout the British Isles, and the preparation of concise reports. Qualifications required are: (*a*) at least ten years' experience in good class electrical installation work (including flameproof installations) (*b*) an ordinary National Certificate in Electrical Engineering or equivalent. Applicants should have had previous experience in inspection duties. Please write giving full details of age, qualifications, experience, to Personnel Department, Bridgewater House, Cleveland Row, St. James's, S.W.1. (T 492)

TRANSFORMER ENGINEER required to design transformers up to 700 kVA. Completion or exemption from Military Service and some experience preferred. Surrey Area, good conditions, pension scheme, 5-day week. Apply in writing to Nevelin Electric Co., Ltd., Purley Way, Croydon, Surrey. (T 331)

WANTED EXPERIENCED ELECTRICAL ENGINEER for design and manufacture of switchboards for generating sets. Man with initiative to take full control London area. State experience and salary required.—Box No. 4655, Electrical Times. (T 471)

WANTED for the Housecraft Department an ASSISTANT with Domestic Science training, and preferably E.A.W. qualifications and experience in the Electrical Industry. Salary according to qualifications and experience. Reply, giving full particulars to the Assistant Secretary, Electrical Association for Women, 45 Eastcastle St. W.1. (T 459)

WELL-KNOWN manufacturers have a vacancy for a YOUNG MAN to plan, and ultimately take charge of, a section manufacturing discharge lamp control gear. Practical experience of design and/or production of this or similar equipment essential. Excellent conditions of employment and social facilities. Apply, giving details of age, training, experience, etc., to—Box No. 4643, Electrical Times. (T 391)

APPOINTMENTS WANTED

NOW in Pakistan: BRITISH ELECTRICAL ENGINEER, 37, B.SC.(ENG.), A.M.I.E.E., experienced power station commissioning, estimating and supervision of switchgear and cable installation contracts. Shortly available.—Box No. 4519, Electrical Times. (T 21)

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EXTRUSIONS BY MARLEY

Buyers requiring rigid and flexible tubes and sections in thermoplastic materials should ask for a quotation from Marley Extrusions, Dept. 123, Lenham, Maidstone, Kent. Harrietsham 381. (T 116p)

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RECTIFIER, 500 Amp, 3-Phase, 2-16 V, variable stage control. Please write or phone British Engraving, 5 Fitzroy St, W.1. MUSeum 2093. (T 510)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (T 1)

WANTED ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (T 2)

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ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum Cleaner and Drill Armatures replaced from stock 24-hour service. Every job guaranteed. All Vacuum Cleaner parts, hoses, bearings, etc., in stock for any make. Complete overhauls our speciality, Regam Electric Cleaner Service, 95/99 Park Lane, Leeds 1. (T 4)

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (T 3)

INDUSTRIAL and DOMESTIC MOTOR REWINDS and REPAIRS speedily carried out. All work guaranteed. N. France Electronics Ltd., 110 New Road Side, Horsforth, Leeds. Horsforth 2871. (T 6)

LET US SOLVE YOUR BREAKDOWN PROBLEMS, repairs speedily carried out by experts. Collection and Delivery by our own transport. A. T. Robinson, Electrical Power Engineers, The Green, Southall, Middx. Southall 3494/5/6. (T 5)

AGENCIES

M.A.A.—THE BADGE OF A GOOD MANUFACTURERS' AGENT. Manufacturers requiring reputable Agents are invited to communicate with the Secretary, The Manufacturers' Agents Association of Great Britain and Ireland (Inc.), Rosebery House, 8 Breams Buildings, London, E.C.4. Membership available to established agents only. Particulars supplied. (T 118)

FOR SALE

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (T 9)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22. (Forest Hill 2278-9). (T 7)

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DON'T WORRY about your ELECTRICITY BILLS. Fit 1s. slot electric meters for hotels, bedsitters, etc. Prices from 50s. Selectrics Department E.T., Castle Circus House, Torquay. Phone 7218. Trade enquiries invited. Trade discount. (T 16)

ELECTRIC MOTORS, D.C. and A.C., Motor Generator Sets, Alternators and Dynamos. Reconditioned and guaranteed, very large stocks held.
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ELECTRICAL SHEET STEEL OFFCUTS. Plain or varnished. For quantities, sizes and price write—Box No. 4659, Electrical Times. (T 473)

FLAMEPROOF MOTORS, M.G. SETS, D.C. MOTORS, GEARED MOTORS, A.C. MOTORS, TRANSFORMERS, CONTROL GEAR. SPECIALS. FLANGE MOTORS

ELECTROPOWER COMPANY LIMITED

Kingsbury Works, Kingsbury Rd., London, N.W.9
Tel.: COLindale 4621/3
Grams: Lectropowa, Hyde, London (T12p)

FLUORESCENT SHELLS AND FITTINGS. Highest grade 5 ft Batten Shells with curved end covers from 9s. 6d. Lists of Shells and Fittings by return: Cowling and Holdsworth Limited, No. 1 Factory, Romside Trading Estate, North St, Romford. (T 17)

FOR sale in excellent condition, secondhand TRANSFORMER, 440/30 V, 3-phase, 50 cycles, approx. 1 kVA, in steel case with triple pole switch and fuses.—R.D. Engineering Limited, Castle Hill, Douglas, Isle of Man. (T 507)

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MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London, N.22. Tel.: BOW 7221. (T 11)

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SECONDHAND ELECTRIC MOTORS for Sale. Size fractional to 20 h.p. For full details apply to: The Plant Manager, de Havilland Engine Co., Ltd., Leavesden Airfield, Nr. Watford, Herts. (T 460)

2 R.P.H. 12 Paxman DIESEL SETS fitted 330 kVA, B.T.H. Generators, complete with electrical switchboard, synchronising panel and ancillary gear. Further details from Chief Engineer, T. Wall and Sons Ltd., Acton. (T 494)

MISCELLANEOUS

THE POLYTECHNIC
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ELECTRICAL ENGINEERING DEPARTMENT
Head of Department:
D. O. Bishop, PH.D., M.I.E.E.

FULL-TIME DAY COURSES are provided in Electrical and Telecommunications Engineering. The courses, which extend over a period of three to four years, prepare for the Higher National Diploma and professional examinations and for the B.SC.(ENG.) Degree of the University of London.

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Prospectuses may be obtained on application to the undersigned.

J. C. JONES,
Director of Education.
(T 462)

LEARN ELECTRICAL ENGINEERING the practical way. Our new self-study course includes equipment on which experimental work can be carried out. Also courses for all professional examinations. Free brochure from E.M.I. Institutes, Dept. ET.57, London, W.4. (Associated with H.M.V.) (T 461)

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Vibration-resistant snap-action switch mechanism. Trip free
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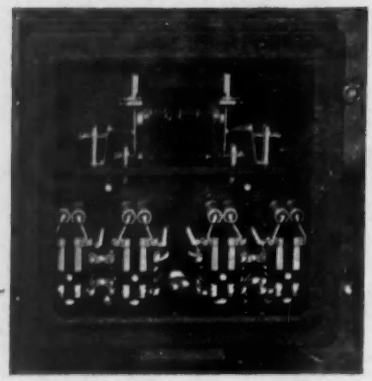

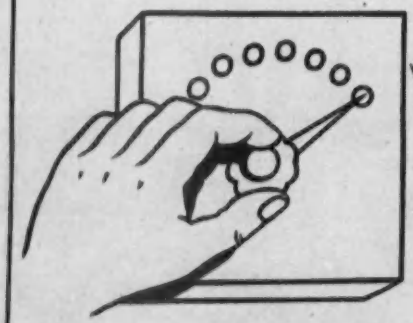

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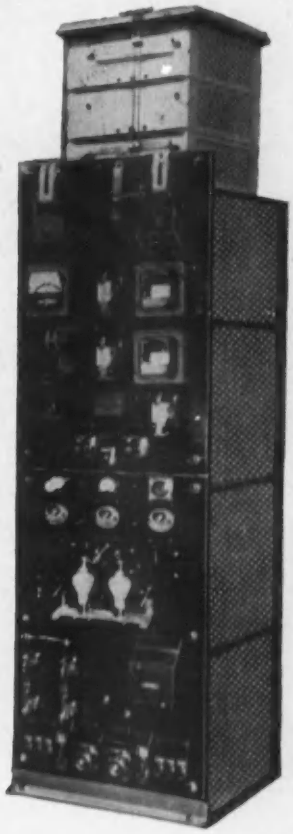

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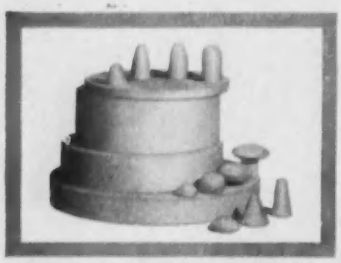

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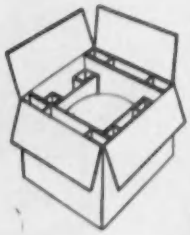

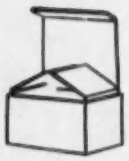

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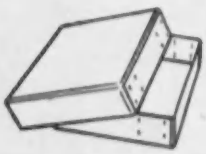

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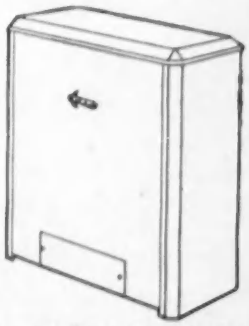

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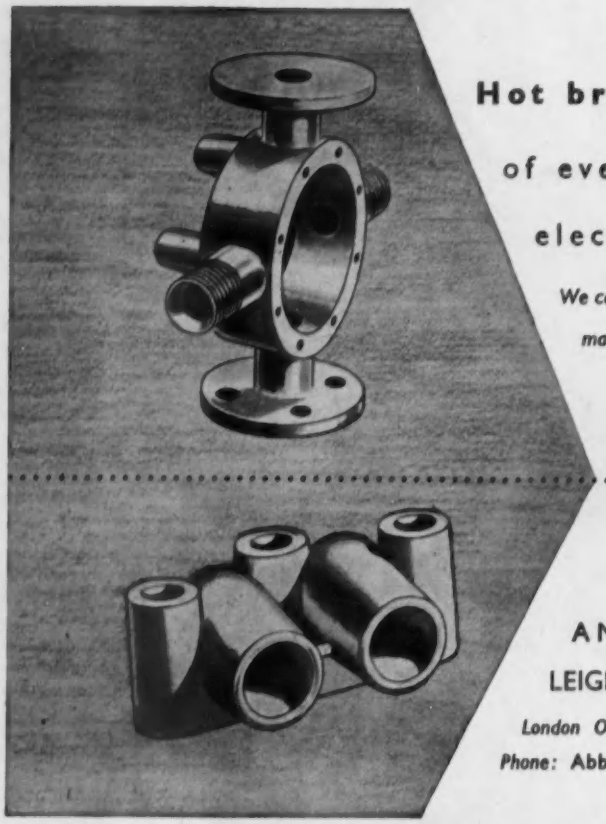

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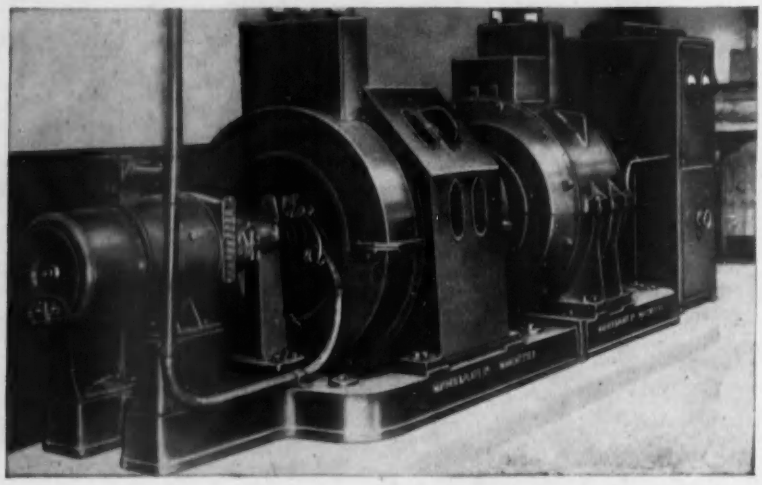

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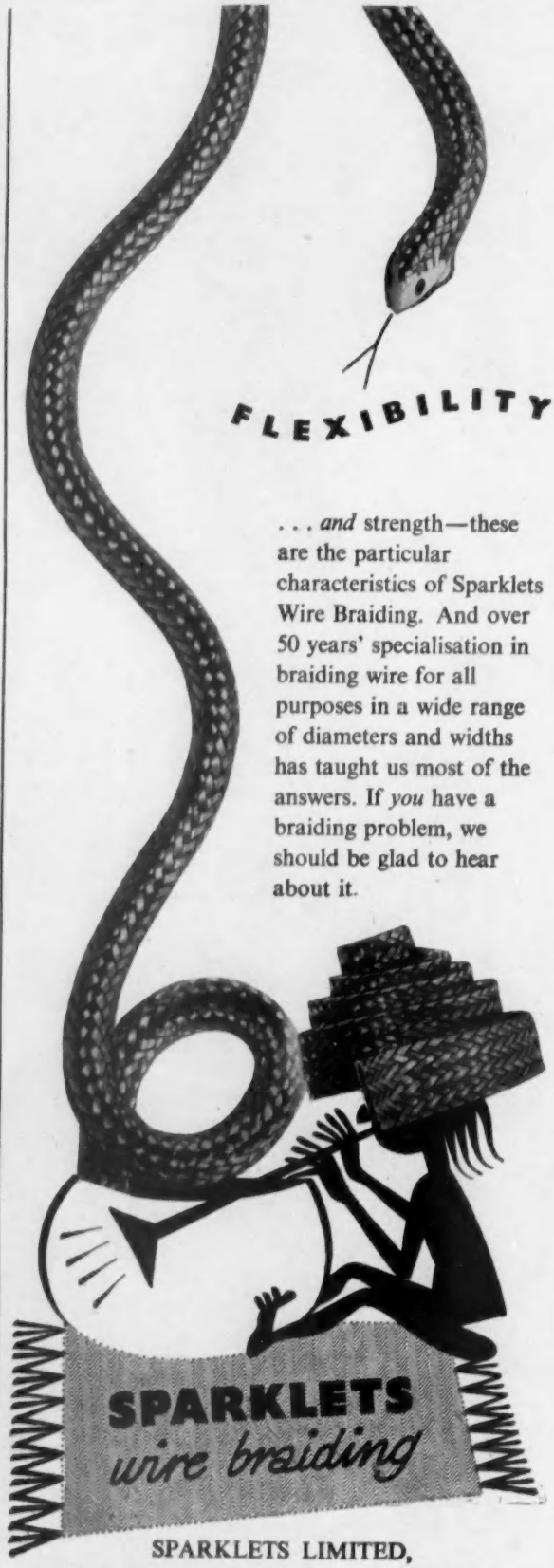

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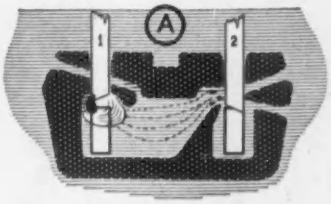
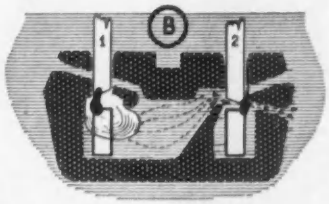
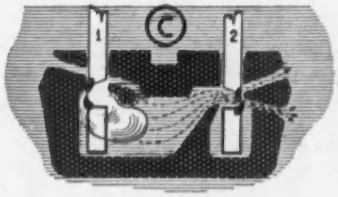


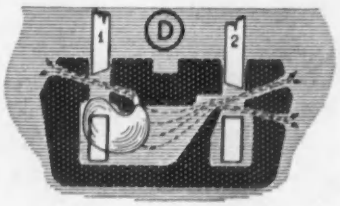
No. 1 electrode leads by ¼ cycle. Pressure trapped except for constricted relief at No. 2 in advance of arc.



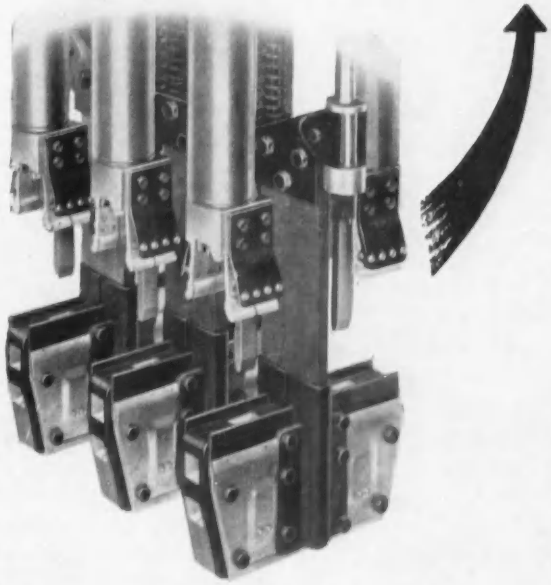
No. 2 electrode breaks contact. Arcing restricted and displaced by pressure.



Arc severed at current zero by high pressure clean oil.



Arc-trap scoured by exhausting pressure and rapidly refilled with clean oil.



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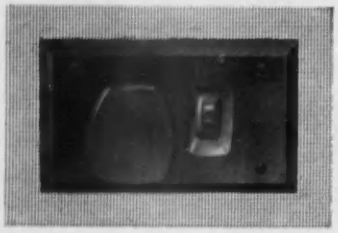

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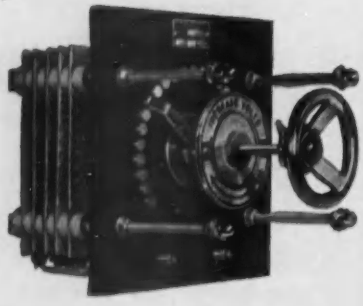

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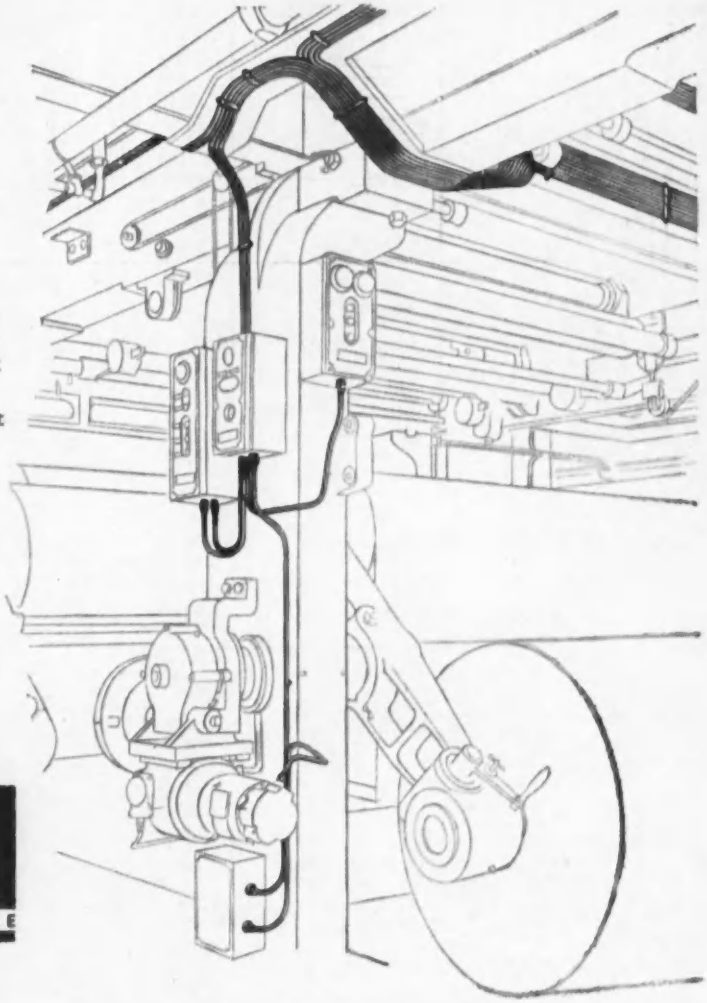

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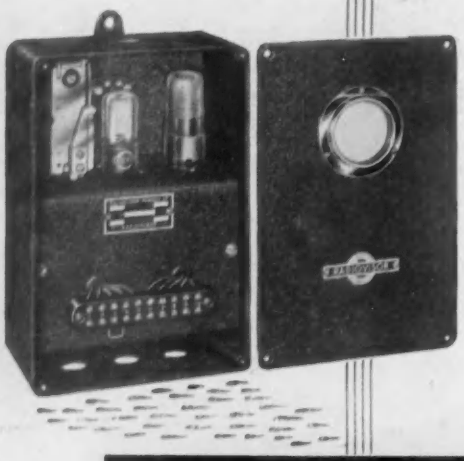

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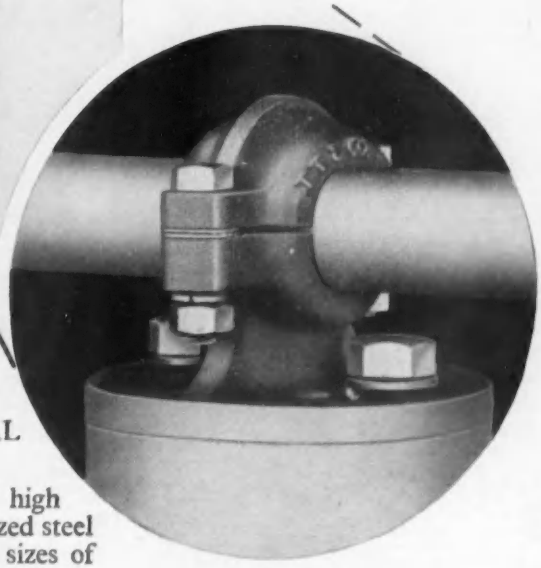

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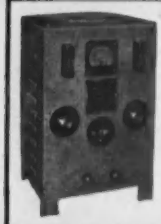

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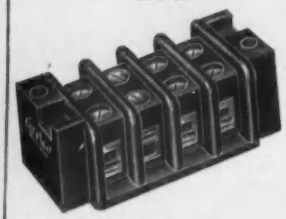

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Service out-of-reach lights, quickly, easily and economically with

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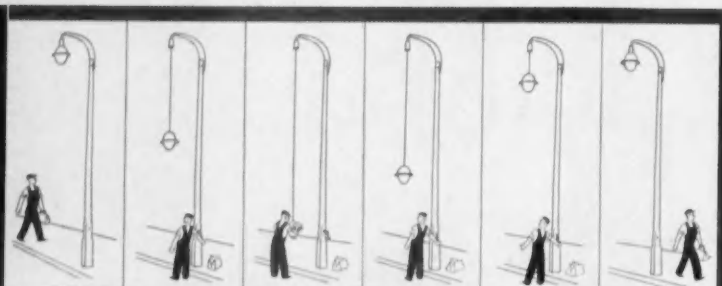

In street or interior lighting systems, wherever lights are inaccessible, L.E.F. Raising and Lowering Gear facilitates maintenance and reduces overheads. *Send for illustrated catalogue.*

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Here's a grand impetus to sales — an entirely new Atlas range introducing a new material for reflectors — 'Rotaflex' spun acetate. Lively, contemporary designs full of sparkle: crystal and pearl mixes: good diffusion: freedom from dust-collecting properties: non-inflammable — these are some of the many pleasing qualities of this enterprising Atlas range.

Not least among other features is versatility. Several shades can be inverted, or used with others to form even more interesting combinations; and a comprehensive range of galleries is available to accommodate lamps from 60 to 200 w. ratings.

for lighting schemes

TOP RIGHT: Atlas lighting fitting in 'Rotaflex' design No. RXS 0200. Lower half is in pearl with upper half in crystal mix to provide generous upward lighting. This shape is available in two sizes to suit lamps from 60 - 200 w.

ABOVE LEFT: Atlas design No. RXA 0200 again has a lower half of pearl 'Rotaflex' and upper half in crystal mix. This design, however, can be used equally well in an inverted position, effective light distribution being provided in both upward and downward directions.

LEFT: Another attractive design — No. RXB 0200, in pearl 'Rotaflex' only, available in two sizes. All these fittings can be used with batten or cord lampholders. Galleries are carefully matched to sizes of fittings and lamps.

...introduced by ATLAS

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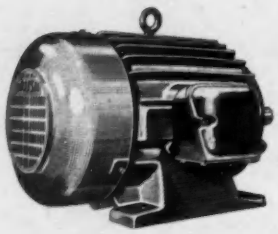
Maximum Efficiency



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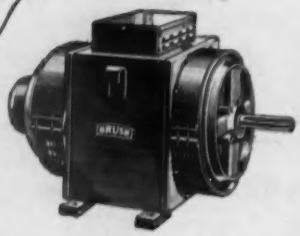
Brush small motors can conform to BSI, CSA or NEMA standards. So wide is the Brush range that your 'special' may already be among our existing types.



SQUARE PATH ALTERNATORS

Brush Square Path Alternators are built in a wide range of sizes with outputs from 1½ to 35kVA, self-regulating, self exciting. They can be bought complete with Control Switch Gear.

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H.R.C. FUSE LINKS

Brush High Rupturing Capacity fuse links are used by leading manufacturers all over the world. Their range covers current ratings from 2 to 300 amperes. (A.S.T.A. certified).

MADE BY BRUSH means that a component is designed to meet the maximum stress of the most exacting service life–not just to fill the minimum requirements of a specification. If you are interested in competitive prices and on-time delivery–get in touch with BRUSH.

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BRUSH ELECTRICAL ENGINEERING CO. LTD., HOPKINSON WORKS, CARDIFF · MEMBER OF THE BRUSH GROUP

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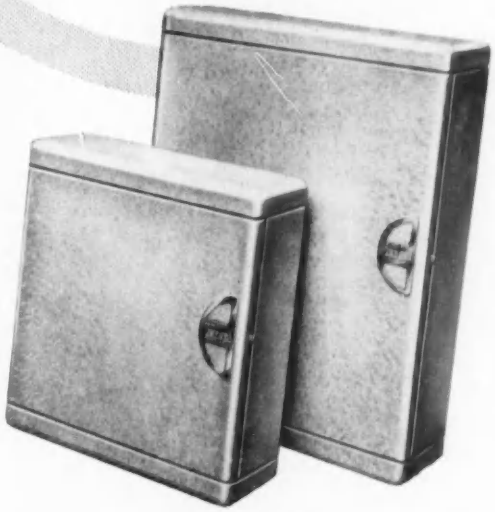
New

HIGH BREAKING CAPACITY

CABINET STYLE DISTRIBUTION BOARDS



These Fuseboards have no projections or excrescences of any kind, save the simple door catch. All edges are rounded to a uniform radius, the lid is sunk flush and the hinges are invisible.

Particular attention has been paid to the finish and the pressed steel cabinets are heavily cadmium plated all over.

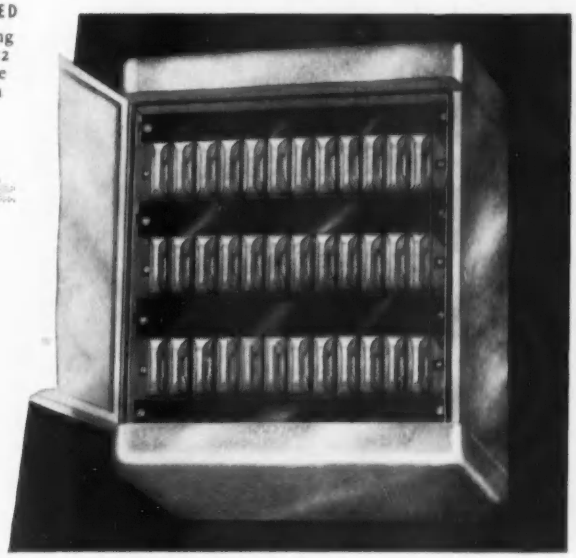
The use of the sunk lid has enabled an internal hinge to be combined with a full width door swing of nearly 180° so that when the board is opened the lid is not protruding into the passage way, or interfering with access from a ladder where boards are mounted high on the wall.

UNOBTRUSIVELY EFFICIENT

NEW ENERGY LIMITING FUSES INCORPORATED

These Boards are fitted with Aeroflex Energy Limiting High Breaking Capacity Cartridge Fuses to BS.88 - 1952 Cat. 440 AC5 Class P. Standard fully wired cartridge fuse links are included unless otherwise specified, when appropriate underwirings can be fitted.

AEROFLEX **Fluvent**



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